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TRANSACTIONS

OF THE

LEICESTER

Literary & Philosophical

SOCIETY.

NEW QUARTERLY SERIES.

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Oct 1886 -
July 1892
v1 :6

VOL. I.

COMPRISING

PARTS I. to XII., OCTOBER, 1886, to JULY, 1889,

TOGETHER WITH THE

REPORTS OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETINGS,

Assembled June 27th, 1887, June 18th, 1888, and June 24th, 1889.

LEICESTER:
GEORGE GIBBONS & Co., 49, KING STREET,
1889.

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PART I, OCTOBER, 1886.

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PREFACE.

THIS New Series of TRANSACTIONS of the LEICESTER LITERARY AND PHILOSOPHICAL SOCIETY, which will be published in quarterly numbers, has been authorised by the Council upon the recommendation of a Committee appointed by them to consider the desirability of making some change in the publication of the Society's Reports and Transactions. Owing to the activity of the various Sections, the bulk of the Transactions has increased so greatly, that they now require a far larger space than that which has hitherto been found for them between the covers of the Annual Report. Another reason for the proposed form of publication in quarterly numbers lay in the expectation that such a method of presenting to the members the work of the Society would help not only to invigorate the workers, but also to interest others in the work, and so to keep alive in our Society the spirit of membership.

It is also hoped that the New Series of Transactions may be useful—especially to the Sections—as a medium for communications and announcements.

Each quarterly number will be issued gratis to all members of the Society; Sectional Associates will be supplied with copies upon payment of an additional subscription of half-a-crown a year; extra copies will be supplied to members of the Society, at the price of one shilling each, and the price of each copy to the general public will also be one shilling.

The next number will be published in January, 1887, and the Editors will be much obliged to the Chairmen of the Sections if they will send in the next quarter's Reports and Transactions before December 15th, 1886.

CHARLES JAMES BILLSON,
WILLIAM SIMPSON, JUNR., } *Editors.*

October 1, 1886.

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Officers of the Society and of the Sections.

Session 1885-6.

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E. F. COOPER, F.L.S. | J. D. PAUL, F.G.S.

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B. ASTRONOMY, PHYSICS, AND CHEMISTRY,
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Chairman, MONTAGU BROWNE, F.Z.S.
Secretary, W. A. VICE, M.B.

Number of Members.

Subscribing 264, Lady Associates 29, Honorary 22.—Total 315.

General Meetings.

Fortnightly, on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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Session 1885—86.

GENERAL MEETINGS.

October 5th, 1885.—Inaugural Address of The PRESIDENT (Rev. JAMES WENT, M.A.)

The PRESIDENT, after referring to the past history of the Society, and maintaining that the system of professional lectures was a perfectly legitimate outcome of the original idea, strongly commended the work of the various Sections as carrying out in the best manner the object for which the Society was originally founded. The development of the system of having short courses of lectures, which the Society had tried, would, he thought, prepare the way for the establishment in Leicester, at some future time, of a University College, the object of which should be to give advanced instruction in every branch of human knowledge. He suggested that this ideal might be approached by the formation of a Central Educational Council, in which the various educational bodies of the town should be represented. A local college can only succeed where the secondary schools furnish a sufficient supply of well-trained students, who demand higher teaching. The PRESIDENT then discussed the financial difficulties of meeting such a demand, when it shall arise; and, in the absence of Government aid, pointed out three sources of means—(1) private liberality, (2) ancient endowments, (3) municipal grants. Turning to the subject of technical education, he emphasized its social and educational influence. The old book-knowledge system threatened to make England a nation of commercial clerks; technical education, in helping us to realise the dignity of manual labour, tends to substitute skilled artisans for superfluous clerks, to the great benefit both of employer and of employed. But technical education in Leicester is only a beginning, and requires development both above and below. The PRESIDENT concluded his address with a review of the position held by such a Society as that over which he presided, in a commercial age. It upholds the love of knowledge for its own sake, abates the rage of competition, and discourages hollow pretence and self-assertion.

October 19th, 1885.—Professor WILLIAM KNIGHT, LL.D., Saint Andrew's, on "Idealism and Empiricism in Art, Life and Literature."—(Professional.)

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November 2nd, 1885.—Rev. JOHN HUNTER, of Hull, on "Tragedy and Comedy in Literature and Life."

The Lecturer, after commenting generally upon the close relations which exist between literature and life, discussed the tragic and comic elements in life and their reflection, interpretation and idealisation in ancient and modern literature. These twin elements are intermingled in literature in obedience to the truth of life; not for contrast, but for completeness. The highest form of literary art is tragedy, and the most perfect tragedies are those of the Greeks and of Shakespeare, the difference between them resting mainly upon their different use of the supernatural. The chief forms of the tragic conflict are the struggles between the conscious life of man and the blind forces of nature, between the individual man and his social environment, between the higher and the lower nature of man himself. These are all comprised in the contradiction between the real and the ideal, which is the standing tragedy of life. The modern drama rightly seeks the final solution of the tragic conflict in the invisible realms. The lecture was illustrated by many quotations from the Greek plays, Shakespeare, Goëthe, Schlegel, Coleridge, Victor Hugo, George Eliot and other writers.

November 16th, 1885.—F. W. H. MYERS, Esq., M.A., on "Aims and Methods of Psychical Research."—(Professional).

November 23rd, 1885.—SPECIAL EXTRA EVENING under the superintendence of Sectional Committees.

Rev. E. ATKINS, B.Sc., read a valuable paper upon "Allotropic and Allied Elements," which was illustrated by many successful and effective experiments.

November 30th, 1885.—CHARLES BIRD, Esq., B.A., F.G.S., Head Master of Rochester Mathematical School, on "Chalk."

The Lecturer demonstrated the various constituent qualities of Chalk, and gave an interesting description of the features of the various Chalk formations. By the aid of the oxy-hydrogen limelight lantern he illustrated the latter part of his subject by photographs thrown on the screen, showing the Chalk formations in the South of England.

December 14th, 1885.—Professor R. S. BALL, LL.D., F.R.S., on "The last great achievements in Astronomy."—(Professional).

January 11th, 1886.—Professor JOHN STUART BLACKIE on "Wit and Wisdom of Scottish Song."—(Professional).

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January 25th, 1886.—Rev. J. Page Hopps on "Some personal experiences in the dim regions of Psychical Research."

After referring to the unprepared state of the public mind with regard to spiritual phenomena, the Lecturer said that he had never before spoken in public on this subject, although he had been making experiments, and having experiences for twenty years. He believed that beings of the unseen world could, and under certain conditions, did act in the sphere of the seen: and he had found this belief enormously widespread.

The Lecturer then related some extraordinary personal experiences of psychical phenomena, and two instances of remarkable dreams. He did not expect that he should be believed, but maintained that if personal experience alone warranted belief, personal investigation alone warranted denial.

February 8th, 1886.—Miss J. E. Harrison on "Death and the Underworld as seen on Greek Monuments."—(Professional).

February 22nd, 1886.—F. T. Mott, Esq., F.R.G.S., on "The Progressive Development of Organic Life."

The organic life of our earth, regarded from without, is but a passing phase of some perpetual force-wave, and is essentially one, the product of one impulse by which it is evolved into countless combinations. The distinctions of tribe and genus and species would disappear to the view of an outsider, and he would regard the organic world as a single and indivisible whole. Looking from within, and yet bearing in mind the unity of the whole organic kingdom, we may trace its evolution or progressive development. Written history cannot help us much, but Geology and Embryology are two independent witnesses which corroborate each other, and each of these sciences shows how the progenitor of all existing forms of life was a minute speck of structureless jelly, and that higher forms came into existence successively by the gradual change of one type into another. The Lecturer then traced this genealogy, in such outline as the present state of knowledge would permit, by the aid of an excellent diagram, which represented the process of development of organic life from the monēron through the leading groups of the animal and vegetable kingdoms, into which the monēron has been differentiated. In conclusion, the Lecturer pointed out the vast difference between man and the rest of the organic world, a difference which suggested to him the idea that man is the first completed form in an entirely new series of the animal world, and that a new grand section would be added to the animal kingdom, the section of humanity. We are already something more than the highest of the mammals, and we know not yet what we shall be.

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March 1st, 1886.—SPECIAL EXTRA EVENING under the Superintendence of Sectional Committees.

Mr. J. D. PAUL, F.G.S., read a short paper on "Mountains," in which he drew special attention to their structure, taking as an example the peculiar strata of the Alps in Switzerland, and enquiring into the agencies which have influenced their formation.

March 8th, 1886.—JAMES ORROCK, Esq., on "The English Art."

Mr. ORROCK pleaded for the establishment in London of a Permanent Gallery of National Art; and in support of his plea, pointed out the characteristic qualities of English painting, and especially of water-colour drawing, a branch of art indigenous to England, and destined, as the Lecturer thought, for a glorious future.

March 25th, 1886.—M. L. LEWIS, Esq., M.A., LL.M., on "Gulliver's Travels."

The Lecturer, after some introductory remarks upon the nature of satire, and a comparison between the style of Swift and that of other great satirists and writers of allegory, explained the political and social condition of England at the time when "Gulliver" was written. He then pointed out in detail the different objects and methods of the satire employed in each of the four narratives, concluding with a lament for the bitterness of the fourth book, in which the remedial satire of abuses gives place to a barren denunciation of all mankind.

June 21st, 1886.—FIFTY-FIRST ANNUAL GENERAL MEETING.

The Report of the Council was read and the Reports and Transactions of the Sections were presented.

Income for the year, £299 16s. 0d.

Expenditure, £287 12s. 6d.

Balance in hand, £12 3s. 6d.

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THE RECORDS OF THE CORPORATION OF THE BOROUGH OF LEICESTER.

By William Kelly, F.S.A., F.R.H.S. (Read before Section "A.")

Shortly before the meeting of the Congress of the Sanitary Institute of Great Britain in Leicester, in September, 1885, I was asked by our worthy colleague, Mr. Wm. Jackson (who as President of the Leicester Society of Architects, took an active part in the preparations for the Congress) to draw up an account of the chief objects of interest in the Muniment-room at the Town Hall. On sending the MS. to Mr. Jackson, I found that it was not a descriptive account which was required, but simply the names of such objects in the Muniment-room, to form part of a list of the chief objects of historical, antiquarian, and general interest in the town, for the guidance and information of our visitors.

For that purpose my ten sheets of description were cut down to fifteen lines of print.

Since then, I have been repeatedly urged by our Chairman to read the MS. before this Section of our Society, which I have hitherto declined to do, as it was not prepared with any such intent, and as it comprises much that must be familiar to all of you. At last, however, I have had to comply with the desire expressed, and I now submit the Paper to the Section with some introductory remarks, and some further additions to the documents described.

My first acquaintance with the Borough Records took place about forty years ago, at which period my friend, the late Mr. James Thompson, F.R.H.S., intended preparing a History of Leicester, to be derived as far as possible from original sources—a project which we know, after great labour, he very successfully accomplished. His first object was to obtain free access to the documents in the Muniment-room at the old Guildhall —which was at once granted by that excellent officer and learned lawyer, Mr. Stone, then the Town Clerk—accompanied, however, with the remark that "he expected that nothing of value would be met with, but merely a lot of old terriers of lands and similar papers;" showing how little was then known of the almost unequalled collection of historical MSS. which, as a provincial town, we possess.

Free access to the records in the Muniment-room having thus been granted, my co-operation was sought by Mr. Thompson, and we were, for a time, joined by my old friend, Mr. W. Napier Reeve, F.S.A., and Mr. Philip Bainbrigg Maddock, then a Solicitor in the town, but who afterwards entered the Church. Our colleagues, however, soon tired of the work of research, and Mr. Thompson and I were left to ourselves.

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The Muniment-room (still existing) was a small, square, dungeon-like room, opening out of the Mayor's Parlour, at the old Guildhall. On the north side of it projected deeply the back of the large fireplace in the Parlour, whilst on the south was a small window—about a foot or fifteen inches high—filled with small leaded panes of glass, without any opening for ventilation, and looking out upon the detached part of St. Martin's Church-yard, the level of which was far above the floor of the room. In the corner near the window lay a great heap of Chamberlains' Accounts and other papers, all in a confused mass, a prey to rats and saturated with moisture, caused by the overflowing of a water-butt filtrating through the porous stone wall of the building; owing to which the contents of some of the documents were hopelessly effaced, whilst others were rotting away and crumbled under the touch.

The numerous royal and other charters, the Guild and Mayor's rolls, &c., &c., were all in confusion, whilst the large collection of autograph letters and other documents, known as the Hall Papers, although placed in portfolios, were lying in another heap on the damp floor without any arrangement.

After reducing the chaotic mass of charters and other loose records to something like order, by placing them in a series of drawers, which we labelled, we made an offer to the Town Council to arrange the Hall Papers and the Chamberlains' Accounts, and to superintend their being bound in a series of volumes, if the necessary funds were granted for the purpose, which was done. The result was a collection of 38 volumes of Chamberlains' Accounts, extending from the year 1587 to 1760; and 24 volumes of Hall Papers, extending from 1583 to 1710.

These labours being completed, on the 6th August, 1849, we addressed a joint letter to the Town Council, giving a descriptive account of the chief contents and high historical value of these two classes of records, but to which (as it occupied more than three pages of foolscap), I can only refer. The letter was ordered to be entered on the minutes, and a vote of thanks was accorded to us for our services.

The new Town Hall having been erected and opened, it was decided to have a fire-proof room prepared for the proper reception and arrangement of the Town Records from their resting place for centuries at the old Guildhall; and, at a meeting of the Sub-Committee, which had been appointed on the previous day (August 28th, 1877), it was resolved, "That the removal and arrangement of the ancient documents and charters be left in the hands of the Chairman (Mr. Alfred Burgess), Mr. Paget and Mr. Kempson; and that they be requested to invite the assistance of Mr. Kelly."

Before beginning our labours, after the whole contents of the old Muniment-room had been removed to the new Town Hall, I wrote on behalf of the Sub-Committee to Sir Thos. Duffus Hardy, the Deputy Keeper of the Public Records, to ask his advice as to the best mode of arrangement, especially of the numerous vellum and parchment rolls of various sizes; at the same time sending him some particulars respecting

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the general nature of the Town Records. To this the following reply was received:—

"Rolls House, Chancery Lane,
"17th September, 1877.

"Dear Sir,

"The account you give of the documents belonging to the Borough of Leicester is highly interesting, and appears to me to be of historical importance. I will, therefore, if you approve of my suggestion, send one of our Inspectors to Leicester (at our expense) to make a full report upon the Leicester Records to the Commissioners on Historical Manuscripts. You then, on seeing the Report, can make any arrangement with our Reporter for putting the same in chronological and consultable order.

"This latter proceeding must, of course, be at the expense of the Borough. If you will let me know what you think of this plan, I will take immediate steps to have it carried out."

"Believe me, Dear Sir,
"To be faithfully yours,

"William Kelly, Esq." "T. DUFFUS HARDY."

This offer of Sir Duffus Hardy led, as is well known, to both these arrangements being carried out by Mr. J. Cordy Jeaffreson, B.A., whose accounts of our Borough Records, printed in the Eighth Report of the Commissioners in Historical Manuscripts, is extremely valuable and interesting. He also prepared an Index to the collection of MSS., which has also been printed for the use of the Corporation.

After these remarks on our records in the past, I will proceed with the brief descriptive notices prepared for the Congress of the Sanitary Institute in connection with their present place of deposit.

THE LEICESTER CORPORATION MANUSCRIPTS.

The records of the Borough of Leicester, after being for several centuries deposited in a small dungeon-like room, opening out of the Mayor's Parlour, at the old Guildhall, constantly exposed to injury by damp, and liable to utter destruction by fire, were, in the year 1877, removed to a fire-proof room specially prepared for them on the top floor of the new Town Hall.

At that time their historical value became known to the late Sir T. Duffus Hardy, Deputy Keeper of the Public Records, through whose means Mr. J. Cordy Jeaffreson, B.A., one of the Inspectors of MSS., was sent down to report on them to the Royal Commissioners on Historical Manuscripts, and who was subsequently engaged by the Corporation to arrange and prepare a printed index to the contents of the Record-room.

That gentleman (whose description of them occupies 76 columns of the Eighth Report of the Commissioners), gave it as his opinion that, "excepting the Corporation of the City of London, Leicester possesses the most extensive, valuable and interesting collection of Municipal Records in England."

And the Commissioners in their Report observe that "Few English Boroughs possess an assemblage of records so rich in important evidences

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and pleasant memorials of old English manners as the carefully arranged manuscripts that have been lately removed from a dark and insufficient closet of the former Town Hall to a suitable chamber in the new Municipal Buildings of the Borough of Leicester. Comprising charters and letters patent, the earliest of which were dated in the twelfth century; guild-rolls whose first entries were made in the time of Richard I.; instruments of various kinds, illustrating the career of Simon de Montfort and the most famous of his Plantagenet successors in the thirteenth century; and Chamberlains' Accounts from an early year of Henry the Eighth to the first year of George the Third; a large quantity of correspondence and official literature relating to the municipal interests and domestic concerns of the people of Leicester in the sixteenth and two following centuries; many hundred of deeds, municipal and private, abounding in noteworthy examples of ancient tenures and mediæval conveyancing, and 94 manuscript volumes or folios of collected manuscripts; a Latin Bible (fifteenth century) said to have been used devotionally by Charles the First, and the famous "*Codex Leicestrensis.*" The collection is so copious that to obtain a general view of its multifarious contents, readers must examine two of the largest catalogues of the appendix to this Report."

From this it will be seen at once that it will be quite impossible within the very brief limits at our disposal, to do more than notice a few only of the more remarkable of the Corporation manuscripts.

First amongst the books is the famous "*Codex Leicestrensis*"—a manuscript of the New Testament, in Greek, partly on paper, and partly on vellum, and by Griesbach and Wetstein supposed to be a work of the fourteenth century; it is also noted by Mill, and other eminent scholars. See also "Horne's Introduction to the Critical Knowledge of the Scrip tures," vol. ii., p. 116.

"*The Vellum Book,*" an ancient chartulary of the Borough of Leicester, begun in the fourteenth century; it is still in its original oak covers. It contains transcripts of the early charters of the town, both from the Kings and Earls, from the time of Robert Bossu, the second Norman Earl in the reign of King Stephen, to that of Henry VIII.; a transcript, and a translation (*temp.* Henry VI) of the "Great Charter of Leicester," (hereafter mentioned), in Norman-French, reciting the laws of the ancient Saxon Court of Portmanmote of Leicester; the oaths of those who entered the Merchant Guild, &c., &c.

"*The Town Booke of Actes,*" a folio volume in its original binding, containing ordinances or by-laws, for the government of the town from the reign of Henry VII. to that of Queen Elizabeth (1581). Many of these are highly curious and interesting. It also contains an "Inventory of the Town Armour," letters of the Earl of Huntingdon, the Lord Chancellor (Stephen Gardiner), and others.

"*The Old Lockt Book,*" a large parchment folio volume, containing entries in the fifteenth, sixteenth and seventeenth centuries. Opening with copies of the oaths administered to the Mayor and other officers of the Corporation, the volume contains in its earlier leaves the record of

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transactions *temp.* Edward IV. and Richard III.; transcripts of royal grants, wills of notable testators, as well as records of fines levied in the Court of Portmanmote, and other matters of public moment.

The series of "*Hall Books*," containing an unbroken record of the proceedings at the meetings, or "Common Halls" of the Corporation from the year 1478 to the present day.

"*The Hall Papers*," in 24 folio volumes, extending from 1583 to 1710; and containing, besides an extensive collection of valuable documents of a miscellaneous character, many interesting autograph letters of royal and noble personages, &c.

"*The Rolls of the Merchant Guild*," commencing in the seventh and eighth years of the reign of King Richard the First (A.D. 1196); and which, although the most ancient documents we possess, appear to have been in continuation of still earlier rolls. They extend to the reign of Richard II.

"*The Rolls of the Religious Guild of Corpus Christi*," (to which body the old Guildhall belonged), and various deeds of chantry, &c.

"*The Rolls of the Mayors' Accounts*," containing particulars of the receipts and expenditure of the Borough from the reign of Henry III. to that of Richard II.

"*The Rolls of the Chamberlains' Accounts*," in continuation of the Mayors' Accounts, and extending in this form to the end of the sixteenth century.

"*The Chamberlains' Accounts*," written on paper and collected into 38 oblong folio volumes. These begin with the year 1587, and extend in this form to 1773, when, for the first time, the particulars were entered in books, according to the present system.

"*The Royal Charters*," under the Great Seal, commence with the reign of King John (A.D. 1190), but for particulars of these numerous and interesting records, many of them conferring important privileges on the burgesses of Leicester, reference must be made to the Eighth Report of the Royal Commission on Historical MSS.

The same reference must be made with respect to a similar class of documents—the "*Charters of the Norman Earls of Leicester*," and of the Plantagenet Earls and Dukes of Lancaster. It may, however, be mentioned that three charters were granted to his burgesses of Leicester by our great Earl, Simon de Montfort; one, his remission, *temp.* Henry III., of gable-pence and bridge-silver for ever to them; another, dated in the 39th year of Henry III., substituting, in Leicester, inheritance by primogeniture, instead of the ancient inheritance by the law of Borough English; and which was followed by a royal charter in the 40th year of Henry III. to the same effect; and a third by which, "for the good of his soul," he granted and confirmed to his burgesses of Leicester and their heirs, *that no Jew or Jewess in his time, or in the time of his heirs to the end of the world, should inhabit or remain, or obtain a residence in Leicester;* and he commanded his heirs after him to preserve that liberty, entire and inviolate to the burgesses! And yet this was the great champion of the

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liberties of England, afterwards worshipped as a saint!

The most interesting and historically valuable of these documents, however, is that now known as the "*Great Charter of Leicester*," being ordinances, dated 6th Edward I., of Edmund (Crouchback) first Plantagenet Earl of Leicester (the King's younger brother), for the reform and amendment of the laws and procedure of the ancient Saxon Court of Portmanmote of Leicester, and which, after its very existence had been lost sight of for centuries, was accidentally again brought to light among a mass of much later writings, during Mr. Jeaffreson's arrangement of the Corporation MSS., in the manner described in his Report, where a full transcript is given of this priceless record of an important event in the early history of Leicester. The charter is of unusually large size for the period, is in perfect preservation, and the late Sir T. Duffus Hardy, when Mr. Jeaffreson showed it to him, considered it to be "second only to Magna Charter itself." I have here a facsimile of this priceless treasure of our collection, taken by the autotype process, together with a translation of it into modern English. An interlinear translation of it into English of about the reign of Henry the Sixth is in the "Vellum Book," as before-mentioned, with a copy of the charter, and it is printed in Mr. Jeaffreson's Index to the Records.

The Honour and Manor of Leicester, originally granted to the Norman Earls of Leicester, after passing to the De Montforts, came to the Plantagenet Earls and Dukes of Lancaster, in right of their Earldom of Leicester, and, as such, John of Gaunt succeeded to the office of Seneschal, or High Steward of England.

On his son's accession to the throne, as Henry the Fourth, these possessions and privileges, with the Earldom of Leicester, became merged in the Crown. From this period it appears to have been customary for the Honour of Leicester to be settled as part of the dowry of the Queens Consort of England. It was so held by Katherine, Queen of Henry the Fifth, and also by Queen Margaret of Anjou, under whom the Corporation held the bailiwick of the town on lease, as they had done under Queen Katherine.

Amongst our MSS. is a document under the seal of Queen Margaret, which is of an interesting character, both as illustrating a very curious custom once prevalent in England for men of good position to array themselves, like livery-servants, as a compliment to some great man, (like the Earl of Huntingdon) whose livery they assumed; and, secondly, as a specimen of the language of the period of Henry VI.

It is termed "An Award," and I will read some extracts from it:—

"Margaret, by the grace of God, Quene of England and of ffraunce and Lady of Irelande, Doughter of the Kyng of Sicile and Jerlm. Be it knawen to all men to whom this p^{r}sent writyng (endented) shall come, that whereas a certeyn Comission of my fuldoubtfull Lord was directed to c^{er}teyn p^{er}sones to enquere as well of yevying (giving) of lyv^{er}e (livery) as of other div^{er}s (divers) articles . . . before the Comissioners of the seyd Comission it was p^{r}sented by William Newby and other of our tenntz of Leycestre . . . that c^{er}teyn p^{er}sones, in Leycestre, had taken clothyng of div^{ou}rez p^{er}sones, agenst the forme of the statut; that ys to wete, that

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some of hem had taken clothyng of the Viscount Beaumont, and some of Sr Edward Grey, Lord fferrers of Growby, and some of them had taken clothyng of other div^ou^res p^er^sones, by cause of which p^re^sentement div^ou^res p^er^sones, some of the houshold of the seyd Lord fferrers, and some of the clothyng of the said Lord, with other wele wilners to the said Lord, as yet not to us knowen, by supportacon and favour, and for pleasance to the said Lord, as we ben enfo^ur^med . . . betyn and sore wounetyn the said William Newby, and manesten to bete other of our tenntz of Leycestre. . . . She doth therefore 'ordeyn, deme, and awarde,' that the said Lord Ferrers pay C marks to William Newby, that he 'be good lorde to the said William Newby; and to all other tenntz in our lordship of Leycestre; and that the said shall not give any clothyng or liv^er^y to any p^er^son dwelling within our said lordship,' &c. Yeven the xx day of May, the yere of the reign of my most douted Lord Kyng Hen^re^ the Sext, xxvii."

The above extracts show one of the evils to which the practice led; another mentioned in the deed was that of deer-stealing. William Newby, who was thus beaten and sore wounded, was Mayor of the town in 1425, 1433, and 1444—5.

This "award" of Queen Margaret is illustrated in almost a dramatic manner in the draft of a letter to the Earl of Huntingdon in the reign of Queen Elizabeth, preserved amongst the "Hall Papers."

At that period, the Members of Parliament for the Borough were not elected by the people of the town, but by the Corporation, who, again, were almost compelled to act according to the dictation of the Court, as represented by the Earl of Huntingdon or the Chancellor of the Duchy of Lancaster.

The draft of this letter forms part of an interesting series of correspondence between the Corporation and the Earl, respecting the nomination of the parliamentary representatives of the town in 1601.

The Earl recommended that Mr. (afterwards Sir) William Herrick and Mr. Bromley should be chosen, and in strong language warned them against electing Mr. George Belgrave, of Belgrave (who had greatly offended him), as he hears "that Belgrave still contineweth his great practising in labouring to be chosen;" and he adds, "Goode Mr. Mayor, be carefull of this, as you and the rest will looke to make accompt of me."

It appears that many members of the Corporation were secretly favourable to Mr. Belgrave, and he was elected, as explained in the following letter:

"Right Ho^e^ oure humble dowties rememberd, &c., may yt please yo^ur^ good Lpp. to be c^er^tified, that upon Tuesday morninge laste, being assembled for the choice of o^ur^ Burgesses, Mr. George Belgrave p^re^sented himselfe amongest us, *in a bleive coat wth a bull head*, affirminge and protesting he was yo^ur^ Lp's s^er^vant, and that S^ir^ Henrie Harrington, very late the night before, had obtayned that favour of yo^ur^ ho^r^ in his behalfe; and muche bemoneed his former undewtefull cariage towards yo^ur^ Lp, wth a remorsive remembrance of many most ho^ur^ favors receaved from yo^ur^ Lp. and yo^ur^ house, towards his ancestors, him and his; and recommendinge his former suite to be one of oure Burgesses, being demanded whether he had any letter from yo^ur^ Lp, answered, that this *(poyntinge to his coat and cognizance)*, he hoped was a sufficient testimonie of yo^ur^ Lp's favour towards him, and of his submission towards yo^ur^ ho^ur^; and further, that it was so late before Sr Henrie cold preure yo^ur^ Lp's said favour, as that you cold not well write, and, for the truth of the p^re^mises, he offered his corporal oathe Whereupon we, thinkinge all this to be true, made choyce of him, wth Mr Willm Herricke, to be o^ur^ Burgesses. And now this evening, we

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are credibly certified that y^{ur} Lp. hath geven him no suche entertaynemt; and thus, by his said lewde and most dishonest dealinge, being much abused, we thought it o^{ur} dewties forthewth to signifie the same unto yo^{ur} Lp, humbly cravinge yo^{ur} Lp's most ho^{ur}able favor for some reformacon of this vile practize. And thus, wth remembrance of oure dewties, wee humbly take o^{ur} leaves. From Leic^{r} this xxth day of October, 1601, Your honor's most humble to comaunde.

"WILLM ROWES, Maier,
"ROBERT HEYRICKE."

And ten others.

The Earl was furious, and sent an angry and characteristic reply, but of which it may be sufficient to say that he tells the Mayor that—"Notwithstanding this treacherous device of that cunning practisore I feare it will appeare, upon the scanninge of this accydent y^{t} there remaynes a false brother amongst you . . . And as for y^{t} p^{r}sone hymself whoe hathe thus shameleslye sought to dishonoure me and deceave you, I will, by the grace of God, take such order as in honor and lawfullye I maye, bothe for ye better unfouldinge, of this, as also for suche punyshm^{t} as the law will inflict,"—which he did by proceedings against Mr. Belgrave in the Star Chamber.

But to return from this digression to the connection between the Queens Consort of England and the ancient Honour and Manor of Leicester.

Some two years ago I met with an entry in the catalogue of an old bookseller at Birmingham, respecting an ancient deed on parchment, which at first puzzled me very much. It was described as follows:—"Leicester, A.D. 1704. Lease of the *Honor of Leicester*, for 18 years. Catherine, Queen Dowager, to John Walker, Esq. Signed by Lords Feversham and Rochester, 1704." That being the third year of Queen Anne's reign, it seemed strange that a Queen Catherine of England should be exercising royal rights with respect to the Honor of Leicester. I wrote for and secured the deed, which now lies before you. Queen Catherine turned out to be no other than Catherine of Braganze, the Queen Consort of the "Merry Monarch," who, on his death, appears to have gone back to Portugal and to have resided there, lost to English history during the intervening twenty years; and she died in the ensuing year at Lisbon, on December 30, 1705, aged 63 years.

The deed, which as you will see, is written on two skins of parchment, describes her as "the most high and excellent Princesse Catherine, Queen Dowager of England, &c." The initial letter is an engraved portrait of the Queen Dowager. The deed bears the stamp of her signature *Catherine R.*, twice, and is signed by Lords Faversham and Rochester, two of her Council "during her absence abroad."

Extract from "Her Ma$^{tie's}$ Lease to John Walker Esq. of the Honor of Leicester for 18 years."

"This Indenture made the eighth day of December in the yeare of our Lord God One Thousand Seaven Hundred and Fower Betweene the most high and Excellent Princesse Catherine by the grace of God of England Scotland ffrance and Ireland Queene Dowager, and the Right honourable Lewis Earle of ffeversham Lord Chamberlaine of the Household to the said Queenes Majestie, Lawrence Earle of Rochester

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and Sr Richard Bellings Knight Principall Secretary and Master of Requests to the said Queens Majestie of the one part, and John Walker of Grayes Inne in the County of Midlesex, Esquire, of the other part."

This document proves conclusively that the old custom, derived from the time of Henry the Fifth, for the Queens Consort to have the Honor and Manor of Leicester settled upon them as part of their dowry, existed until the reign of Charles the Second; and as his Queen was doubtless the last who enjoyed the privilege, this document is of historic interest, and as such I purpose presenting it to the Corporation, so that it may be preserved amongst the Borough Records at the Town Hall.

There are other objects of interest in that collection which ought to be noticed in this descriptive list, especially a curious quarto volume in its original binding, containing miscellaneous manuscripts of a literary character, of the thirteenth and fourteenth centuries, a Paper on which was read by the late Mr. Thomas Wright, F.S.A. (the learned author of "The Celt, the Roman and the Saxon"), at the Congress of the Archæological Association at Leicester, in the year 1862, but space forbids and I fear I have already greatly taxed your patience by this far too lengthy, but still very imperfect and inadequate description of the treasures of the Borough Muniment-room.

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NOTES ON A RECENT EXPOSURE OF THE LOWER LIAS AND RHÆTICS IN THE SPINNEY HILLS, LEICESTER.

By Messrs. E. F. Bates and L. Hodges. (Read before Section "C,") with a diagram.

It seems likely that the Spinney Hills, which have already afforded an interesting section of the Rhætic beds at their northern extremity, may yield further evidence worth the attention of geologists. We need scarcely refer to the account given by Mr. W. J. Harrison of these beds, as it is so well known. It will be remembered that the lower part only of the Rhætics was then exposed, showing their junction with the underlying Trias.

As the hill is encroached upon for the construction of new streets, the laying down of culverts, and for other purposes, still higher beds in the series are being constantly opened in the various cuttings. There is every reason to believe that before long it will be possible to give the entire thickness of the Rhætics as developed there, from their junction with the Keuper Marls of the Trias to that of the shales and limestones of the Lower Lias. Amongst the many later exposures, one only has reached to the bone bed, at the base of the Rhætics. This was in a field on the western slope of the hill overlooking the brickyard, now abandoned, in which were exposed the gypsiferous marls of the Trias. We came upon it in two out of three trial holes for clay which were sunk in the centre of this field, a short distance below the crest of the hill. It was a hard pyritic band about one inch in thickness, containing a few coprolites and fishes' teeth and scales, overlaid by dark and light shales similar to those described by Mr. Harrison on the eastern side of the hill. The whole of the shales were not represented, there being only seven feet nine inches clearly defined, covered by four feet seven inches of soil and drift. In other cuttings higher up on the hill, are thin shales containing a great number of tabular septaria, irregularly dispersed, somewhat elliptical in shape, and many of them of great size.

More important than this, in laying down a culvert further to the south, near to the angle of the Spinney, beds were exposed in the trench, which are, undoubtedly, the uppermost part of the Rhætics. Their junction with the Lower Lias was clearly shown.

It will be seen from the diagram that as the cutting commenced at the Diseworth Street end of the section and was continued in a southerly direction, the lowest beds came into view first. These beds are at the top of the Rhætics. As the work proceeded, other strata gradually appeared above, which, by the fossil evidence, are shown to belong to the Lower Lias.

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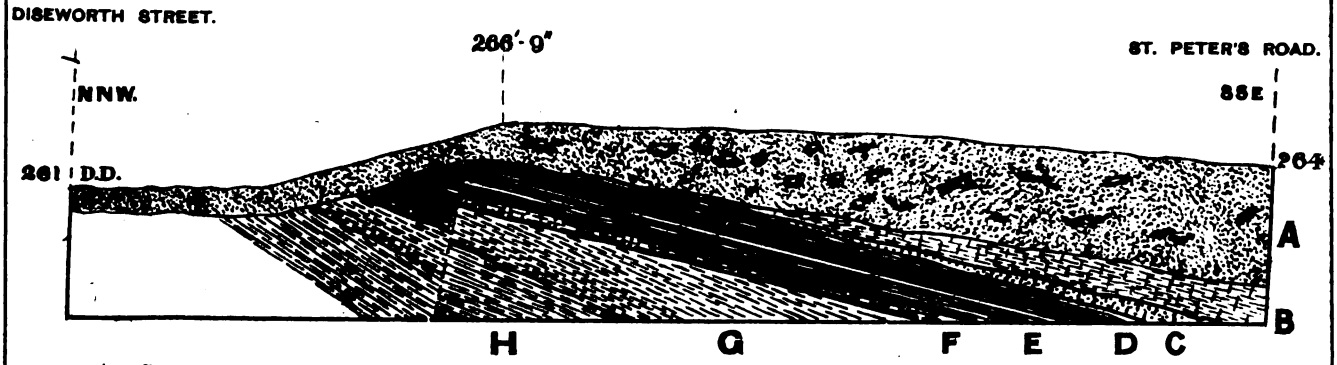
SECTION OF THE SPINNEY HILLS, LEICESTER,

SHEWN IN A TRENCH FOR A CULVERT.

Horizontal Scale, 168 ft. to 1 in.; Vertical Scale, 16 ft. to 1 in.; Length of Section, 1065 ft.



A.—Glacial Clay, 2′ 5″ to 10′ 0″

Lower Lias:
- B.—Decomposed Limestone, 4′ 0″
- C.—Earthy Limestone, 2′ 0″ to 4′ 0″
- D & E.—Cream-coloured Calcareous Shales, 4′ 0″

Upper Rhætic:
- F & G.—Marl with a band of Limestone, 4′ 10″
- H.—Blue Marl, 6′ 3″

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A complete statement of the beds in their order of superposition, is as follows:—

SECTION ON SPINNEY HILLS, FROM DISEWORTH STREET TO S. PETER'S ROAD, 1065 FEET IN LENGTH.—GLACIAL DRIFT.

"A" in diagram.—Glacial drift clay with numerous rolled pebbles of quartz, and quartzite, and boulders of Lias limestone, smooth and occasionally striated, with two small boulders of Syenite. Matrix, a coarse mixture of red and blue clay, where the pebbles are most numerous, elsewhere of a yellowish colour with many ferruginous streaks, 2-ft. 5-in. to — 10-ft. 0-in.

LOWER LIAS.

"B."—Decomposed limestone, loosely coherent and earthy. Almost wholly made up of organic remains. In the bed are one or two thin bands of hard blue crystalline looking limestone, coarse in texture, and made up of similar organic materials to that of the decomposed bed in which they occur. Plates, spines and tubercles of Cidaris Edwardsii, joints of Pentacrinus and comminuted shells, chiefly Ostrea, Lima, and Pecten. — 4ft. 0in.

"C."—Yellow earthy limestone, with reddish stains here and there, richly fossiliferous. This would resemble the bed above if thoroughly decomposed and the iron stains washed out, as it is composed of shelly material and Echinus spines, Lima pectinoides, L. gigantea, Ostrea liassica, Pleurotomaria anglica, Ammonites torus—Johnstoni, A. catenatum, Nautilus striatus, Fossil wood. 2-ft. thinning out to — 0-ft. 4-in.

"D" and "E."—Calcareous shales, cream coloured, thickly laminated. In upper part, a thin fissile or flaggy band of cream coloured limestone, four inches in thickness, in the laminations of which are many casts of a small bivalve of the genus Pholodomya. The surface is sometimes covered with a ferruginous earth seam, in which are many decomposed shells. The shales are not fossiliferous. Pecten sp., Ammonites sp., Modiola laevis (all in the limestone band). — 4-ft. 0-in.

UPPER RHÆTIC.

"F" and "G."—Light coloured marl with reddish stains. Very calcareous at the top, where is a nodular band of limestone. The nodules are blue centred, very irregular in shape, and vary in size from 2-ft. by 13-in. to 4-in. by 3-in. Over the nodular band runs a thin earthy ferruginous seam about ½-in. in thickness. — 4-ft. 10-in.

"H."—Blue marl, Axinus cloacinus. — 6-ft. 3-in.

The fossils are for the most part fragmentary and imperfect and hence difficult to identify. We are indebted to Mr. H. Quilter, of Leicester, and Mr. E. Wilson, of the Bristol Museum, for their assistance in naming them. The true dip of the beds is more to the east than shown in the diagram. We believe it to be south-east. The height above O.D. is 261 feet.

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THE CAMPANULAS OF LEICESTERSHIRE.

By F. T. Mott., F.R.G.S. (Read before Section "D,") with an illustration.

The genus *Campanula* comprises about 230 species of plants peculiar to the North Temperate Zone, and inhabiting more or less the whole circuit of it, from Great Britain eastward to the Atlantic coast of North America, but having among them various preferences as to soil and local conditions. It is a well marked genus with inferior ovaries and monopetalous, often tubular flowers, closely allied to the *Composites*, but at once distinguished from them by the scattered arrangement of the flowers in panicles or spikes, instead of in densely packed heads. In a few species, however, there is a tendency to clustering of the flowers, still further indicating their relationship.

Nearly all the *Campanulas* are herbaceous, only two or three species having low shrubby stems; and the flowers are almost always blue, purple or white: red and yellow are rare exceptions. They are further characterized by the very peculiar hairs upon the styles, which are said by Adolphe Brongniart, to be retractile.

Of this genus six species are truly wild in this county, viz.:—

C. rotundifolia (The Hair-bell).
C. patula (The Spreading Bell-flower).
C. latifolia (The Giant Bell-flower).
C. Trachelium (The Nettle-leaved Bell-flower).
C. glomerata (The Clustered Bell-flower).
C. hybrida (The Specularia or Small-flowered Venus's Looking Glass).

The common Hair-bell, *C. rotundifolia*, is found in every one of our twelve county districts. The Giant Bell-flower, *C. latifolia*, occurs in eight of them. These two are northern forms, and though the Hair-bell is the slenderest and the Giant the largest and most robust species in the whole genus, they are equally hardy, and comparatively careless of local conditions, except that while the Giant loves the shade, the little Hair-bell delights in sunshine.

The three species, *Trachelium*, *glomerata*, and *hybrida* flourish only on dry soils, and as the drier lands of England lie chiefly on the east and south, where the porous chalk formation absorbs the rainfall, these three, though abundant in the eastern and southern counties, are scarce in Leicestershire, and are chiefly confined to the eastern and southern districts of the county, where the dry calcareous oolites just touch our borders. *Campanula Trachelium* has, indeed, succeeded in travelling to the centre of the county, and has been found in Brasil Wood, while *hybrida*, being a corn-field plant, and perhaps not a true native, is oc-

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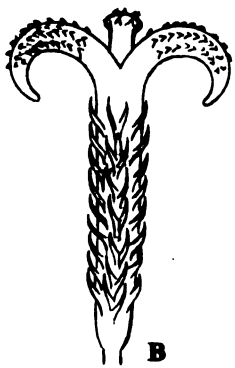

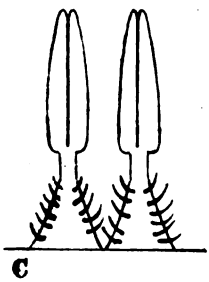

CAMPANULA GLOMERATA.

A.—Immature Style.

B.—Mature Style with ripe Stigma.

C.—Immature Stamens.

D.—Position of Stamens when discharging pollen upon the hairy Style.

E.—Pollen grains, much magnified.

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casionally carried to various parts of the county with seed corn, and appears as a casual in odd places. But *glomerata* being a plant of road-sides and pastures, adheres to the eastern districts, and has never been recorded elsewhere in the county.

Campanula patula is the rarest of our six species, and is confined to one locality. It seems to prefer the western side of England and soil derived from granite and slaty rocks, rather than chalk or sand. Its habitation here is at the foot of the syenitic hill called Buddon Wood. In no other part of the county has it ever been seen. Here, however, it is, or used to be until a few years ago, plentiful and luxuriant, growing from three to four feet high and conspicuously overtopping the nettles, docks and brambles which occupied the same ditch. It is found also about the Malvern Hills, which are of similar formation, and is abundant in Shropshire, and, more or less, along the whole borderland between England and Wales. It is recorded also for Derbyshire and Nottinghamshire, but these records are not well authenticated, and *C. Rapunculus*, naturalized or escaped from gardens, has often been mistaken for it.

Several of our six species show very distinctly the tendency of the genus to have the root leaves broader and rounder than those on the stem. In *rotundifolia* it is especially marked, the root leaves being nearly orbicular, while the stem leaves are narrowly linear, with a few at the base of the stem and on the barren shoots of intermediate form. In *Trachelium* the root leaves are always long-stalked and cordate, while the stem leaves have short petioles with the base truncate, and the floral bracts are sessile. I have two curious specimens of *Trachelium* from Brasil Wood, in one of which the two lowest root leaves are orbicular, the leaves of the main stem triangular as usual, and those of a side branch lanceolate. The other specimen is similar, but without the orbicular root leaves. These are plants in which the leaders have been broken off, so that the side branches are abnormally developed. I have seen no other specimens with the orbicular root leaves or the lanceolate branch leaves, which are more oval than the usual bracts of the flowering branches, and are shortly petioled. Neither Hooker, Babington or Syme mention the orbicular root leaves.

I am not aware that any marked variation of colour has been observed in the flowers of any of the *Campanulas* in this county, with the exception of *rotundifolia*, which is occasionally white. *Hybrida* has the ovary very long and narrow, and is by some botanists separated from the true *Campanulas* under the generic name of *Specularia*.

There are four British *Campanulas* which are not found wild in this county, viz.:—*Rapunculus*, *Rapunculoides* and *persicifolia*, all of which are old garden plants, and though naturalized here and there, are probably not indigenous in Britain at all; and the delicate little creeping Bell-flower, *Campanula hederacea*, which is a true native of damp woods and bogs in the western and southern counties, but does not reach Leicestershire. This is now separated from the other *Campanulas* under the generic name of *Wahlenbergia*.

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DATES OF ARRIVAL O

COMPILED BY

Order—PASSERES. *Family*—TURDIDÆ.	1843.	1844.	1845.	1846.	1848.	
WHEATEAR	April 18	March 28	March 23	...	April 7	A
WHINCHAT	April 18	April 22	...	May 6	April 25	A
REDSTART	April 19	...	May 4	April 12	...	
NIGHTINGALE	...	...	...	...	May 2	M
WHITETHROAT	April 19	April 22	April 26	April 15	April 19	M
LESSER WHITETHROAT ...	...	...	May 15	April 25	...	M
BLACKCAP	April 19	April 22	May 6	April 15	April 19	A
GARDEN WARBLER	...	April 22	May 6	April 18	April 19	A
CHIFFCHAFF	March 31	April 9	March 29	March 27	March 31	A
WILLOW WARBLER	April 19	April 13	April 23	April 12	April 11	A
WOOD WARBLER	...	April 22	...	May 5	May 9	M
REED WARBLER	April 30	April 26	April 29	April 17	May 4	
SEDGE WARBLER	April 19	April 26	April 29	April 17	May 1	A
GRASSHOPPER WARBLER ...	...	April 22	...	April 12	May 2	A
Family—MOTACILLIDÆ.						
YELLOW WAGTAIL	April 7	April 18	April 25	April 16	April 20	A
TREE PIPIT	April 19	April 22	May 6	April 16	April 19	A
RED BACKED SHRIKE ...	...	...	...	...	May 12	
Family—MUSCICAPIDÆ.						
SPOTTED FLYCATCHER ...	...	...	...	May 20	May 16	M
PIED FLYCATCHER	...	...	...	...	...	
Family—HIRUNDINIDÆ.						
SWALLOW	April 9	April 17	April 22	April 11	April 11	A
MARTIN	April 18	April 18	April 24	April 12	April 19	A
SAND MARTIN	April 18	April 21	April 29	April 21	April 19	M
Order—PICARIÆ. *Family*—CYPSELIDÆ.						
SWIFT	...	May 12	May 18	May 5	May 12	M

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Order—PICARIÆ. *Family*—CAPRIMULGIDÆ.	1843.	1844.	1845.	1885.	1886.
NIGHTJAR	...	...	...	...	...
Family—PICIDÆ.					
WRYNECK	April 9	...	...	...	...
Family—UPUPIDÆ.					
HOOPOE	...	...	...	...	...
Family—CUCULIDÆ.					
CUCKOO	April 18	...	April 25	ril 15	April 24
Order—COLUMBÆ. *Family*—COLUMBIDÆ.					
TURTLE DOVE	...	...	...	y 9	May 6
PASSENGER PIGEON	...	...	...	...	...
Order—GALLINÆ. *Family*—PHASIANIDÆ.					
QUAIL	...	...	...	...	...
Order—FULICARIÆ. *Family*—RALLIDÆ					
CORN CRAKE	...	...	May 6	y 8	April 29
Order—LIMICOLÆ. *Family*—SCOLOPACIDÆ.					
COMMON SANDPIPER ...	April 19	...	...	ril 23	May 2
Order—PYGOPODES. *Family*—PODICIPIDÆ.					
GREAT CRESTED GREBE ...	...	...	...	...	April 10

NOTE.—The dates between 1843-55 are compiled from B[illegible]n foregoing list, from 1877-86 are compiled from notes furnished by Messrs. [illegible] Davenport, and some few by Browne and others.

REMARKS.—Usually, the first to appear is the Wheatea[illegible]ccidental occur- able by the white patch over its tail. It may be looked for o[illegible]h as the Honey- its name of "Fallow Chat,"—any time after the middle of Marc[illegible]irds also receive in the following week, appears the Chiffchaff, whose shrill an[illegible]many rare winter

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE AND ECONOMICS.

The meetings of this Section have been discontinued, as usual, during the summer months.

W. JACKSON, *Chairman.*

SECTION "B."

FOR ASTRONOMY, PHYSICS AND CHEMISTRY.

This Section does not meet during the summer quarter.

E. ATKINS, *Chairman.*

SECTION "C."

FOR GEOLOGY.

The members of the Section are still engaged in working out some of the details of the geology of the neighbourhood, though little progress can be made in this work except when new excavations or accident present fresh exposures. The members will take advantage of these opportunities as they occur, and their observations will be communicated to the Section and recorded in the Transactions of the Society.

The first meeting of the Winter Session was held on the 9th of September, when Mr. FRANK BAKER, C.E., read a paper on the Geology of the neighbourhood of Sheffield. The paper pointed out the positions of the seams of coal in this part of the South Yorkshire Coalfield, and explained how the hard beds of sandstone in the Coal Measures and in the underlying Millstone Grit had, by resisting denudation more than the softer shales lying between them, given rise to the principal features of the surface of the country lying to the west of Sheffield. The Rivelin valley was specially described and illustrated by maps and sections. The members were much interested in the examination of a section taken completely across the Pennine Chain, drawn by Mr. BAKER to a large

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scale, which showed the details of the geological structure and illustrated the action of the force of compression which gives rise to anticlinals and to mountain chains. The members spent some time in the examination of several fossils exhibited. A fine specimen of a large septarian nodule specially engaged their attention.

J. D. PAUL, *Chairman.*

SECTION "D."

FOR BIOLOGY (BOTANY AND ZOOLOGY).

May 19th.—Mr. MOTT was re-elected Chairman, and Dr. COOPER, Secretary.

Mr. W. A. VICE reported that the occupants of some small cocoons on a chrysanthemum leaf, brought to the Section last month by Mr. E. F. COOPER, had come out, and proved to be dipterous flies about 1-6th of an inch long; probably a species of *Phytomyza.*

Mr. E. F. COOPER, F.L.S., exhibited a spadix of *Arum maculatum.*

The Rev. T. A. PRESTON, M.A., described the arrangements in this remarkable flower for catching and detaining small insects in order to convey the pollen to the stigmas. Upon this a discussion arose as to the need of such an arrangement merely to secure *self*-fertilization, which must almost certainly take place automatically, seeing that the anthers are just above the stigmas. Yet the reflexed hairs on the abortive flowers seem to prevent the insects from escaping to carry the pollen to other flowers. It was suggested that the members should investigate the process individually, and report their observations.

Miss NOBLE exhibited a flowering specimen of *Geum rivale*, from Burbage Wood.

The CHAIRMAN exhibited fertile fronds of *Onoclea (Struthiopteris) germanica*, full of ripe spores, from Belvoir Castle, portions of which were distributed for cultivation, as this fine hardy fern is said to do well in gardens.

Mr. J. T. THORPE exhibited a beautiful living specimen of *Pinguicula vulgaris*, in flower in a pot, which he had had in his possession for several years. The leaves were observed to be covered with glandular papillæ, and about their incurved edges were seen the remains of several captured flies. Mr. THORPE stated that from his own observations he found that the edges were rolled over in about 24 hours after the capture of an insect, and that they unrolled themselves and became flattened out again in from 30 to 40 hours more. Inquiry was made as to how many British plants are known to be carnivorous. The list, as at present known, is a small one—viz.: *Pinguicula vulgaris*, *Drosera* (three species), *Utricularia vulgaris*, and probably *U. minor* and *intermedia*; perhaps also two or three species of *Saxifraga* should be included, and further

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investigations may add other genera. Many plants exude viscid secretions by which insects are caught and killed without being utilized as food by those plants.

Rev. T. A. PRESTON, M.A., described "The Practical Naturalist's Diary," a useful and well-arranged book published by Swan Sonnenschein and Co., price 2s. 6d. Several other forms of diaries and note books were exhibited and their merits discussed.

June 16th.—Mr. E. F. COOPER, F.L.S., read an extract from Grant Allen's paper on *Arum maculatum*, in which he states that *cross*-fertilization is secured by insects who escape from the spathes after the "lobster-pot hairs" are shrivelled.

The CHAIRMAN and Rev. T. A. PRESTON both stated that these hairs were not shrivelled in a number of old spathes which they had examined, and in which flies were lying dead. The CHAIRMAN said he had examined a number of spathes in which there were no traces of flies, but the stigmas were fully fertilized notwithstanding. The pollen dropped from the anthers in abundance; some of it was caught by the little bunches of stigmas, the rest fell to the bottom of the spathe and became matted together by the pollen-tubes, which were protruded without the stimulus of contact with the stigmas.

Rev. T. A. PRESTON, M.A., exhibited heads of the Fuller's Teasel, which is said to be a form due to cultivation; also a cake of Vegetable Wax from Ceylon, a substance obtained from various trees and shrubs in many different countries.

Mr. E. F. COOPER, F.L.S., exhibited dried plants from Lancashire, including *Andromeda polifolia*, *Myrrhis odorata*, &c., and a curious small green excrescence abundant in the cracks of the bark of oaks in that district, possibly a gall of some kind.

Dr. FINCH exhibited a specimen of the Cockchafer, *Melolontha vulgaris*, one of the most injurious of our native insects. Its grubs are said to live for several years in the earth devouring the roots of plants.

Rev. T. A. PRESTON, M.A., gave a very interesting description of the extraordinary contrivances for insuring fertilization in Orchids, illustrated by a number of fine coloured diagrams drawn by Mr. Worthington Smith, which gave rise to some discussion as to the real origin and meaning of such apparently unnecessary complications to secure a very simple object.

July 21st.—Mr. and Miss GRUNDY exhibited growing plants of *Drosera rotundifolia*, *Anagallis tenella*, *Botrychium lunaria*, and *Sphagnum cymbifolium*, in fruit, all from North Wales; also a piece of heart-wood from a very large decaying yew-tree, said to be 900 years old, growing in the same district, the annual rings of wood being plainly visible and about one-eighth of an inch in thickness, indicating an increase of about one foot diameter in 50 years during the period of vigorous growth.

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Dr. FINCH exhibited fresh specimens of *Colchicum autumnale* in fruit, the length of the stem from the corm to the capsule being just one foot, the capsule itself 1½-inch, and the decaying leaves one foot long.

The CHAIRMAN exhibited a specimen of the curiously spotted moth, *Abraxas ulmata*, taken in Burbage Wood.

The CHAIRMAN read a short paper "On the hairless condition of the human skin," followed by discussion.

FIELD-DAY EXCURSIONS.

June 9th.—To Tilton Hill and Loseby. Not much of special interest was met with beyond a few new localities for some of the less common plants.

July 14th.—To Burbage Wood and Common. *Utricularia vulgaris* was found abundantly in its old locality, a pond between Elmsthorpe Station and Burbage Wood, but not in flower. In a pond in the Wood was found *Equisetum limosum*, var.: *fluviatile*, in its extreme and most typical form. Several interesting moths and beetles were collected.

F. T. MOTT, *Chairman.*

SECTION "E."

June 7th.—Four members present.

A communication was read by the SECRETARY from Mr. M. BROWNE, on "The Lanner Falcon and Leonard Faulkner." This was to prove that falconry flourished in Leicestershire during feudal times, that the Lanner Falcon was used, and that the second "Falconer" was "Leonard Falconer," *i.e.*, the "Lanner Falconer."

Mr. ROWLEY showed specimens of the "Small Eggar" and "Death's Head" moths, bred out by himself; the larvæ of the latter being from "Freemen's Common." He also read some notes upon the peculiarity of the *Acherontia Atropos* with reference to its capability of emitting sound in all stages of its existence; stating the various explanation which had been attempted.

July 5th.—Six members present.

CHAIRMAN'S Address.

August.—No meeting.

Sept. 13th.—Six members present.

Business meeting.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1886.
Oct. 11.—PRESIDENT's Address. "Some of the Dangers and Disadvantages of Nineteenth Century Civilisation."
,, 25.—Lecture. FREDERIC HARRISON, Esq., M.A. "The City: Ancient, Mediæval, Modern, and the Ideal."
Nov. 8.—Lecture. Rev. H. R. HAWEIS, M.A. "Music and Noise."
,, 22.—Lecture. Professor SMITHELLS, B.Sc., F.C.S. (Yorkshire College, Leeds.) "Vapour." (With experiments and diagrams, illustrating the results of work done since 1877 in solidifying and liquefying the supposed "permanent" gases.
Dec. 6.—Lecture. Mrs. HENRY FAWCETT. "The Social Position of Women: its progress during the last 100 years."
,, 20.—A Discussion. Introduced by Dr. BLUNT. "Cremation: from Philosophical, Scientific, and Sanitary points of view."
1887.
Jan. 10.—Lecture. Dr. A. C. POPE, M.R.C.S. "Hahnemann: his Life and Work."
,, 24.—Lecture. Sir JOHN LUBBOCK, Bart., M.P. "Savages: their Ways, Customs, and Ideas." *(This Lecture will be given in the Temperance Hall.)*
Feb. 7.—Readings. Arranged for by the PRESIDENT. "Old English Songs and Sonnets."
,, 21.—Lecture. Rev. STOPFORD A. BROOKE, M.A. "Shelley."
Mar. 7.—Lecture. Dr. H. W. CROSSKEY, F.G.S. "The Physical History of Great Britain from the Glacial Epoch."
,, 21.—Lecture. JUSTIN MCCARTHY, Esq., M.P. "The House of Commons: a Picture of its Ways and Principal Figures."

SECTIONAL MEETINGS.

GENERAL SECTIONAL MEETINGS.

The dates and arrangements for the usual EXTRA EVENINGS under the superintendence of Sectional Committees, will be announced by circular.

SECTION "A."

Chairman—Mr. W. JACKSON, Loseby Lane, Leicester.
Secretary—Mr. J. SCAMPTON, 1, Pelham Street, Leicester.

1886. *List of Papers to be read.*
Tuesday, Oct. 12.—Mr. JACKSON. "Archæological Notes."
,, Nov. 9. { Mr. CHARLES J. BILLSON, M.A. "Shakespeare's Library." / Mr. R. HARVEY, LL.B. (Subject to be named.)
,, Dec. 14. { Mr. W. SIMPSON, Junr. "Trial by Jury in Ancient Leicester." / Mr. A. H. PAGET, A.R.I.B.A. "The Opening of some of Shakespeare's Tragedies."
1887.
Tuesday, Feb. 8.—Mr. J. D. PAUL, F.G.S. "Lourdes and Leicester."
,, Mar. 8.—Mr. THOS. CARTER, LL.B. "Local names."

W. JACKSON, *Chairman.*

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SECTION "B."

Chairman—Rev. E. ATKINS, B.Sc., The Fosse.

Secretary—W. S. FRANKS, F.R.A.S., 1, High Street.

Meetings will be held during the present Session upon the undermentioned dates:—

1886—October 21st, November 18th, December 16th.
1887—January 20th, February 17th, March 17th.

The meetings are held in the Laboratory at the Wyggeston Boys' School, High Cross Street, at 7.30 p.m.

E. ATKINS, *Chairman.*

SECTION "C."

Chairman—J. D. PAUL, F.G.S., 118, Regent Road.

Secretary—A. F. ATKINS, 165, London Road.

The meetings of the Section will be held in the Council Room of the Society, at the Museum, on the second Thursday of October, November, and December, at half-past Seven in the evening.

On Thursday, October the 14th, C. A. MOORE, Esq., M.D., will read a paper on "The Influence of the Geology of a District on the Health of its Inhabitants." Should time permit, the Section will consider the Inaugural Address of the President of the British Association at Birmingham, and also the Address of Professor G. H. DARWIN to the Mathematical and Physical Section of the Association.

J. D. PAUL, *Chairman.*

SECTION "D."

Chairman—F. T. MOTT, F.R.G.S., Birstal Hill, near Leicester.

Hon. Secretary—Dr. COOPER, King Street, Leicester.

Gentlemen or Ladies who desire to join this Section should communicate with the Hon. Secretary or the Chairman. Subscription for Members of the Literary and Philosophical Society, 1s. per annum; for non-members, 2s. 6d.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

FIELD DAYS—The second Wednesday afternoon in each summer month.

EVENING MEETINGS.

October 20.—Exhibition of specimens. Paper by Mr. H. E. QUILTER on "The Metamorphoses of *Galeruca nymphea*, L.; a Coleopterous Insect."

November 17.—Exhibition of specimens. Paper by Dr. TOMKINS on "The Cultivated Bacillus of Anthrax."

December 15.—Exhibition of specimens. Paper by the CHAIRMAN on "Foreign Fruits available for Acclimatization in England."

A Fungus Foray will probably be held in the month of October, of which notice will be given by circular.

F. T. MOTT, *Chairman.*

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SECTION "E."

Chairman—F. M. POPE, M.D., Campbell House, London Road.

Secretary—W. A. VICE, M.B., 5, Belvoir Street.

List of Papers.

October 18.—Mr. F. R. ROWLEY. "Notes on the Structure of Insects."
November 1.—Mr. G. H. STORER. "Notes on Birds observed at Virginia, County Cavan," with specimens.
December 13.—Mr. H. E. QUILTER.

The paper of the evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

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SOCIETY.

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1887.

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Session 1886-87.

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W. N. REEVE, F.S.A.
GEORGE STEVENSON.

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Retiring June, 1887.	Retiring June, 1888.
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Chairman, WILLIAM JACKSON.
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B. ASTRONOMY, PHYSICS, AND CHEMISTRY,
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C. GEOLOGY,
Chairman, J. D. PAUL, F.G.S.
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D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, F. T. MOTT, F.R.G.S.
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Session 1886-87.

OCTOBER, 1886, to JANUARY, 1887.

GENERAL MEETINGS.

October 11th, 1886.—Inaugural Address of The PRESIDENT (Rev. J. PAGE HOPPS.)

The PRESIDENT, in speaking of "The Dangers and Disadvantages of the Nineteenth Century," maintained that these dangers and disadvantages were inseparable from an age of progress, being indeed only dangers and difficulties by the way, as things incomplete, one-sided, misunderstood. Among such weaknesses and exaggerations, he first noted the development of an utterly false standard of social worth, owing to the worship of Mammon and the over-intensity of class-feeling. Another evil of this century is its carelessness of individuality. It is careful of the type, a day of masses, and bad for the individual: the end of civilization being to produce not factory "hands" but men and women. To forgetfulness of this truth may be ascribed the sad destruction of natural beauty in England. We are "shut out daily to a more thin and outward rind." To such of our nineteenth century inventions as the telegraph and the newspaper there is a reverse side of danger, from the hasty products of sensationalism tending to destroy the old steady habit of reading. The same haste and excess characterise our education, and warp to a great extent the benefit of our higher education for women, especially as the pressure of amusement keeps pace with the pressure of study. Turning to the great achievements of modern Science, the PRESIDENT pointed to their concomitant drawbacks—such as jerry-building, slop-work and adulteration. We have learnt Chemistry, and the "profit on 't is," we know how to poison. In conclusion, he referred to the materialistic tendencies of the life of the day, from which he doubted not, man would eventually turn "when these mammon days are done," to find a higher outlook upon the sphere lying beyond the realm of matter. For the century is after all a grand transitional century, and the Great Power, which shapes our ends was never nearer to us and is "from seeming evil still educing good."

October 25th, 1886.—Mr. FREDERICK HARRISON, M.A., on "The City: Ancient, Mediæval, Modern, and Ideal." (Professional.)

November 8th, 1886.—Rev. H. R. HAWEIS, M.A., on "Music and Noise." (Professional.)

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November 22nd, 1886.—Professor SMITHELLS, B.Sc., F.C.S. (Yorkshire College, Leeds,) on "Vapour," with experiments and diagrams, illustrating the results of work done since 1877 in solidifying and liquefying the supposed "permanent" gases.

The two laws with which the Lecture was chiefly concerned were the following:—

1. *Boyle's Law.*—"The volume of a gas varies inversely with its pressure."
2. *Charles' Law.*—"A gas expands $\frac{1}{273}$ of its volume at 0°c. for every increase of 1°c."

The truth of the first law, which was discovered by the chemist Boyle, in England, in 1662, was tested by a simple experiment which the Lecturer made.

In the year 1854 Natterer made experiments to test this law more accurately, and found that it does not hold good for hydrogen, oxygen, or nitrogen beyond 100 atmospheres.

It had previously been discovered by Faraday that the law of Charles does not apply to steam and other gases which can be brought to a point at which they cease to expand, in accordance with the law of Charles, and become liquids.

By the aid of a simple tube, afterwards known as the Faraday tube, he was able to turn into liquids many things previously known only as gases. The liquids of gas are thus related to gases as water is related to steam: gases are vapours, the steams of certain liquids.

Faraday was successful in liquefying cyanogen and other gases: but there remained some so-called "permanent gases" which defied his attempts to liquefy or freeze them.

In the year 1860 Andrews, sometime Professor at Belfast, made further experiments and obtained furthur results in the liquefaction of gases, which led to a further modification of the law of Charles. Experimenting with carbonic acid gas, he found that it is not converted into a liquid above a certain temperature (30·92°.) The temperature above which a gas ceases to liquefy is called its "critical temperature;" the pressure necessary to liquefy it at that point, its "critical pressure." Thus the critical temperature of carbonic acid gas is 30·92°, its critical pressure 74·°. The isothermals of gases are thus irregular: there is no ideal, perfect gas. The experiments of Andrews were continued by Pictet and Cailletet. On the morning of Sunday, December 22, 1877, Professor Tyndall received a telegram, "Oxygen liquefied—Pictet." Hydrogen was liquefied on the tenth of the next month. Curiously enough, while Pictet was making, with the aid of elaborate and costly apparatus, these great discoveries, Cailletet was producing the very same results with an apparatus of simple construction and slight cost. On November 24th, 1877, he liquefied nitric oxide; on December 30th, in the same year, hydrogen, nitrogen and air. Cailletet used much the same apparatus as Andrews, but he produced more palpable and sudden results (though it is

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certain that Andrews did unknowingly, because so gradually, reduce his gases to liquids) in the following manner. He would compress by mechanical force a volume of gas into an exceedingly small space, and would then remove the pressure on a sudden, when the violent rush of escaping gas would take so much of its heat out of it that it would condense to a liquid at once. The experiments of Cailletet and Pictet have been carried on since 1883 by two Hungarian chemists, Wroblewski and Olszewski.

The temperatures at which the gas or steam becomes liquid, *i.e.*, the boiling points, may be seen on the table following. The liquids obtained from the various gases vary considerably in weight, from $\frac{1}{3}$rd to $\frac{1}{35}$rd of the weight of water.

200	Boiling point of Aniline.
100	" " Water.
	" " Alcohol.
	" " Ether.
0	Freezing point of Water.
	Boiling point of Carbonic Acid.
100	" " Etheline.
	" " Oxygen.
200	" " Hydrogen.
205	" " Air.
225	Lowest temperature yet obtained.
273	

Modern Chemistry has returned to the old atom-theories of Democritus and Lucippus. We distinguish three states of matter, solid, liquid and gaseous. In solids the atoms are close pressed; under the influence of heat solids expand, and become liquid; then after reaching the boiling point they overcome contracting influences and fly off into the atmosphere as gases or vapours. Thus all the solid things of earth are but frozen liquids, the most substantial beings only forms of mist.

December 6th, 1886.—Mrs. Henry Fawcett, on "The Social Position of Women: its progress during the last hundred years." (Professional.)

December 20th, 1886.—A Discussion introduced by Dr. Blunt, on "Cremation: from Philosophical, Scientific, and Sanitary points of view."

The President introduced the subject, and laid down the lines of discussion.

Dr. Blunt then read a paper in which, after commenting upon the prejudice and false sentiment which enveloped the subject, he proceeded

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to enumerate the scientific and sanitary advantages which Cremation has over Burial. Dead organic matter must ultimately be converted into carbonic acid, ammonia and water, and thus return to the air and provide food for the plants, and through plants for animals, so continuing the cycle of life and death. In Cremation the process from death to life is quick, and has no annoyance for the living, causing no pollution of soil, air or water. Indeed, by the adoption of Cremation, we might get rid of some of our zymotic diseases. Another consideration is economy of space. Dr. BLUNT admitted that, given a suitable soil, dry, porous and well-drained, a coffin of perishable material, and plenty of space, Burial might be harmless to the living, and would in three years do the work which Cremation does in one hour. But these happy conditions are seldom or never realized, certainly not in our Leicester Cemetery. Dr. BLUNT then pointed out the dangers of putrefaction, referring to Pasteur's investigations into the origin of the germs of splenetic fever, which have been brought to the surface of the soil from buried and putrefying animals by means of earth-worms. In conclusion he remarked that the only valid argument against Cremation was that it would shock public feeling. But if the question were well ventilated, if a Crematory were established in Leicester, he had no doubt that in the course of a generation it would be Burial that would shock our feelings, not Cremation.

Mr. F. STRINGER BATE, giving expression to the views of those who were opposed to Cremation, maintained that the objections to it were rooted in sentiment and religion. Dr. Blunt had admitted that a proper burial was harmless: then let us reform our mode of burial, and the Cremationists will be put out of court. Cremated bodies are useless, buried bodies feed the plants. Finally, there is no sufficient precedent for Cremation.

Mr. J. PLANT advocated the plan of taking all dead bodies out to sea, and burying them in the Atlantic.

Dr. TOMKINS spoke in favour of Cremation, pointing out the fallacy of Mr. Bate's argument that buried bodies were more useful than those which had been Cremated, which is the reverse of the truth. He also emphasized the fact that whether we bury or burn our dead, we subject them to the same chemical process, a cemetery being nothing but a slow and clumsy crematory. He also touched upon the possible danger of burial in spreading zymotic diseases.

After a few words from Mr. MOTT, Dr. BLUNT briefly replied to the discussion, which was then brought to a close by the PRESIDENT.

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THE FOURTH DIMENSION OF SPACE.

By Charles James Billson, M.A. (Read before Section "B.")

"Est intellectus humanus instar speculi inæqualis ad radios rerum, qui suam naturam naturæ rerum immiscet, eamque distorquet et inficit."—Bacon, *Nov. Org.*, I. XLI.

A lecture was once delivered before a certain learned Society upon the "Inferno" of Dante, which was prefaced by a remark of the lecturer that he was unacquainted with the Italian language. Perhaps I shall be thought equally bold in undertaking to read, before this scientific Section, a Paper on the Fourth Dimension, when I confess that my knowledge of Mathematics is of the most elementary description. Fools rush in, I shall be told, where wise mathematicians fear to tread; and, of course, if this were a purely mathematical subject, it would be a piece of folly and presumption for an ignorant person to meddle with it. But I cannot think that this fascinating question of the existence of a fourth dimension of space ought to be handed over to the mathematician as his private property. It does not lie within the farmed lands of knowledge, but in that delightful no-man's-land of speculation which fringes the borders of the cultivated sciences. It adjoins the domain of Psychology as well as that of Mathematics. So that I do not think a facility in the handling of surds and tangents is necessary for its discussion: and, indeed, I fancy that a strictly mathematical treatment would not lead us to a very satisfactory solution of the question. Of course, a mathematician has no difficulty in proving the existence of a fourth dimension:—give a mathematician his *x*'s and axioms, and he can prove you anything. But the vital point of the inquiry really is: What is the value of his proof? What kind of existence does he demonstrate, and what is it worth? And this is the kind of inquiry which is beyond the mathematician's province. It belongs to the unclaimed wilderness in which any passing knight may break a lance.

First, let us listen to the mathematician. He tells us of three dimensions which are familiar to us from the evidence of the senses—length, breadth, and height. Is there not, in all probability, he asks, a fourth dimension, a fifth, and a sixth? Why should the directions of motion be limited to three? It is true that, as a matter of experience in our human conception of space, there are not more than three directions, there is no fourth dimension. But, argues the Scientific Romancer, who are we? Insignificant and undeveloped pigmies, crawling 'twixt earth and heaven, doomed for our sins, perhaps, for some probationary period, to a beggarly three-dimensional existence. And do we exhaust the peopled Universe? May there not be other more glorious beings to whom our human limitations are as paltry as the limitations of a two-

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dimensional being would appear to us? Nay, does not the exactness of mathematical reasoning lead us, by certain inferences, to the conception of an ampler existence?

"Conceive a being who has been, throughout all the range of his existence, confined to a single straight line. Such a being would know what it was to move to and fro, but no more. The whole of space would be to him but the extension in both directions of the straight line to an infinite direction. It is evident that two such creatures could never pass one another. *We* can conceive their coming out of the straight line, and entering it again; but *they*, having moved always in one straight line, would have no conception of any other direction of motion by which such a result could be effected. The only shape which could exist in a one-dimensional of this kind would be a finite straight line. There would be no difference in the shapes of figures; all that could exist would simply be longer or shorter straight lines."

Yet such a being would be wrong, argue the champions of the fourth dimension, if he were to imagine that his straight line was, in fact, the Universe. In the same manner, a being of two dimensions, confined to a plane superficies, would be mistaken in conceiving the whole of space as an infinite plane. And, by analogy, we three-dimensional human beings are likewise mistaken when we conceive space as an infinite cube. There must be a fourth dimensional figure, which is to the cube what the cube is to the square, and the square to the line.

Indeed, by a process of mathematical reasoning, it is even possible to work out the characteristic features of this geometrical figure, and we learn, with a shudder, that, taking x to be a line, x^4 is an unspeakable creature with no fewer than 16 points, 32 lines, and 24 surfaces, while its chaotic bulk is actually bounded, in some extraordinary way, by eight cubes!

"Monstrum immane, informe, ingens, cui lumen ademptum."

So much for the mathematician. It would ill become the unlearned to dispute his conclusions. In fact, the mathematical process is so easy, the steps in the genealogy are so simple, that even the lay mind cannot but recognise this inconceivable monstrosity as the legitimate offspring of the primitive line. But to the lay mind it looks rather like a *reductio ad absurdum*. We ask ourselves, with some suspicion, the meaning of the terms which we have been using. What is a line? What is a plane? How are these related to the cube? The cube, we are told, is generated by the square, the square by the line. And the line is generated—how? Light breaks upon the puzzle when we remember that the conception of a line is, after all, an abstraction from our sensible apprehension of a cube. And so, to the lay mind, the mathematical argument resolves itself into that peculiar figure familiar to logicians as a "vicious circle." If the line exists only in the fairy-land of mathematical abstractions, the brood of many-dimensional ogres must belong to the same realm of fantasy.

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I am well aware that I am touching here with a light pen upon a most fundamental question—the nature of mathematical truth. But all that I need insist upon now is an appeal to common sense, which sufficiently points out a difference between the existence of a line and the existence of a cube. Briefly and roughly, it comes to this, that a cube exists in nature, and a line, or a plane, does not. A cube is a fact, a line is an idea.

The world of our senses is a world of cubes: every phenomenon is of three dimensions. Although we can, owing to long practice, mentally dissociate one dimension from another and abstract the ideas of line and plane, and even of a no-dimensional point; yet we can form no mental images of these abstractions, because, as we know very well, these things have no actual existence in finite space. It is obvious, on a moment's consideration, that the conception of any figure, except a cube, would involve the conception of infinity and thus transcend the conditions of our intellect. To imagine a point is to imagine the infinitely little: to imagine a line is to imagine a line extending to infinity in both directions, or bounded by infinite points, and *à fortiori*, the conception of a plane involves the conception of the infinite. It is true that the cube also touches infinity at each of its sides. As in the old puzzle of Achilles and the Tortoise, you may go on dividing and subdividing the bounding lines of any figure *ad infinitum*. But this is pastime for the imagination. Achilles' difficulty is solved by walking, and the cube stands out before the senses as a definite shape. You can form a mental picture of a cube; we are looking at cubes all our lives, and do not once in ten years trouble our heads about their unimaginable extremities. For lines and planes are altogether unimaginable; we cannot form any mental pictures of them. All our impressions of things in space assume the form of the cube.

The ideas, then, of point and line and plane are, after all, but shadows of this space world, thrown by our finite intelligence upon the surrounding infinite. These, and with them the whole ascending series of dimensions, are but mental abstractions from our cubical impressions of the external world. They are, to use the common antithesis, imaginary and not real.

I do not think that we overstate the case when we say that in any line of investigation, whether physical or psychological, it is of paramount importance clearly to recognise and maintain a distinction between the bare impressions of sense and the play of ideas. Strange things result from the confusion between *ideas* and *facts*. For example: A bold speculator has lately suggested that the gases which we know are but liquids expanding in our space, under the influence of a centre of attraction situate in four dimensional space; just as liquids spread over a plane under the influence of gravity. To speak thus of another kind of space, which has relations with our space and can influence material phenomena, is to confuse ideas and facts. It is like speaking of the influence of the syllogism on the formation of crystals. Indeed, when you once begin to break down the barriers which separate the world of sensible fact from

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the supersensuous world of idea, there is no end to the grotesque confusion which may ensue. To this fundamental error we may trace the solemn conclaves of theologians deliberating upon points hardly less ridiculous than the famous *crux*, "How many angels can dance together on the point of a needle?" It leads, only too frequently, to the lunatic asylum. In any case it involves a sad waste of intellectual and moral force, and induces a vast quantity of drivel. It is the very life blood of all mystical quandaries, astrologies, necromancies, and occult sciences.

Superstition would fain play with the idea, that, behind this veil of three dimensional space, there may lurk spirits existent in the fourth dimension, who occasionally intrude upon our sphere. How easily would such an hypothesis account for the phenomena of "Spiritualism." It would be quite an every-day affair for such spirits to pass the "flaming bounds" of space; you could never catch them. If you shut them up in a box, they might move off quietly in their fourth direction, and on opening the box you would find it empty. I have seen it argued that the Davenport Brothers were beings of four-dimensional capacity, on the authority of Felix Klein, who has shown that in a four dimensional space there can be no knots. The same theory has been employed to explain the mysteries of table-turning, and other similar manifestations. Professor Zoellner superfluously accounted for the feats of the American medium, Slade, on the principle of the fourth dimension. Professor Simon Newcomb has demonstrated analytically that if a fourth dimension were added to space, a closed material surface (or shell) could be turned inside out by simple flexure, without either stretching or tearing.

This new *deus ex machina* might indeed solve many mysteries, if we could once get over the fact that cubical apprehension is, for the present at any rate, a condition of our mental outlook on the world, and that when we speak of points and lines and fourth dimensions, we are not speaking of outward phenomena, we are speaking of ideas, tenants of the Unseen Universe.

Both worlds are very real and very near to us, the external and the internal, the world of sense, and the supersensuous, the realm of fact and the realm of idea. They may be, in the last resort, only different phases of one and the same consciousness. That, however, is a question for the psychologist. The student of facts must *ex hypothesi* distinguish them; if he imports into his field of vision any alien matter from the domain of ideas, he forsakes his scientific standpoint. In Pope's great vision of the Empire of Dulness, at the close of the Dunciad, this intellectual confusion is emphasised as one of the signs of approaching ruin :—

> "Physic of Metaphysic begs defence,
> And Metaphysic calls for aid on Sense:
> *See Mystery to Mathematics fly,—*
> In vain they gaze, turn giddy, rave, and die!
> * * * * *
> Thy hand, great Anarch, lets the curtain fall,
> And universal darkness buries all!"

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The seductiveness of this temptation to serve two masters could not be better shown than by the fact that even this science of Mathematics, the most exact of all the sciences, "whose methods are said to be as infallible as its foundations are supposed to be permanent, and which, ever since the dawn of human intelligence, has pursued the even tenor of its way amidst all vicissitudes of speculation," should have fallen a victim to this weakness at last, and made alliance with Mystery. The champions of the fourth dimension might indeed plead that they are fully aware of the fictitious character of the fourth dimension, and make use of it, as of lines and planes, only for the purpose of obtaining results applicable in our three dimensional world. In that case we should have no quarrel with them. But in fact they do not take up this position. On the contrary, as we shall presently see, they defend and nurse that intellectual confusion to which Pope referred.

The defence which is usually made for this tendency to project ideas into the material world, is well known. "How do I know, after all," I am asked, "that a fourth dimension, or anything else, belongs to the internal world only, and has no place among external things? It may seem so to you," I am told, "but that only shows your own crudity.

"'There are more things in heaven and earth . . .
Than are dreamt of in your *Philosophy*.'

"All mortals are not in such a raw and rudimentary condition as you are. There is a barrier between the two worlds only for such gross souls as yours; more sympathetic and spiritual beings have developed a sixth sense, of which you can have no idea, and by means of which they can play leap-frog with your philosophical hedges and fences. Some remarkably well cultivated subjects have quite an every-day acquaintance with four-dimensional existence, just as you have with three-dimensional space. This is not matter of argument and reason: we do not expect you to believe us: we are Superior Persons, *voilà tout!*"

Let us gird up our loins to answer these aggravating assertions!

Would that we could take refuge in the dead and gone theories of intuition! The theories of Kant and Schopenhauer, which make space and time intuitive *à priori* conceptions of the mind, may be less true philosophically than the English theory which has come down from Hume, who reduced these conceptions to casual creatures of habit, to Herbert Spencer, who has enlarged the sphere of habit so as to include the whole of past ancestral existence and has for ever erased the word "casual." But Kant's theory, however faulty or out of date, seems to be, at any rate, of more practical use as a safeguard against wild speculations. If we could hold fast the Kantian view, we could answer the mystic's "questionings of sense and outward things," in a very simple way. If three-dimensional space be an intuitive *à priori* conception of the mind, there can be no escape from it: the mind can never grow out of it, for it is a condition precedent of mind. The only logical position for the fourth-dimensionalist would be that he is out of his mind, and that is not a position that he would be likely to take up.

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Still scientific fourth-dimensionalists would meet this counter-attack from the Kantian side by arguing that there may be minds in which the form of intuition differs from the ordinary three-dimensional conception, because, as Kant himself admits, the precise form of intuition in any given intellect is purely a question of fact. To which one could only reply that the facts are against them.

And this brings us round to a consideration of the mystic's position from a more modern standpoint.

When we once admit that the development of the mind may effect even the most fundamental of its characteristics, we may be nearer the truth, but at the same time we open the gates to a flood of foolish speculation. How often do we see Science and Nonsense standing shoulder to shoulder as they parade their wares amicably together in the open daylight of controversy! A short time ago I read a clever essay in the "Nineteenth Century," in which it was proved very agreeably and conclusively, from convenient evolutionary data, that death is merely a matter of habit, and that we might all get into the much better habit of living for ever if we would only make an effort. In the midst of such unsettling agitations of opinion, it is well to bear in mind constantly, that, although the most fundamental principles of life and consciousness may presumably be transformed by the slow grinding of evolutionary ages, such fundamental changes are really quite beyond our scope. The scale of evolution is so vast, that we should hardly expect to find in the very small slice of the history of existence which Science can cut out for us, any other than comparatively superficial and formal changes. To hold that such a primary law of consciousness as the three-dimensional conception of space may become transformed after some billions of years, is, at least, a harmless indulgence of the imagination; but we do not find any such traces of transformation in the past as would justify us in attributing a fourth-dimensional conception even to the most highly developed minds of the present age.

For consider the enormous extent of the ordinary conception of space. It is not even a peculiarity of the human brain, but must have existed ages before the separation of the anthropoid apes from our human ancestry. So far as we can see, every atom of awakening consciousness opens its eyes upon a world of three dimensions. At any rate, Science can satisfactorily explain the physical senses which are developed in the lower forms of organic life, as being the result of impressions from a cubical universe like our own. But the fourth-dimensionalist claims to possess a sixth sense. Well, if this were a physical sense, it would be related to our world of space like the rest. No "sense" of a material body could have relations outside the world of sense. When mystics tell us of the development of another "sense," they are using the word metaphorically. They mean, and they would probably admit that they mean, not a physical sense, like the sense of sight or smell, but a spiritual sense, a new birth of consciousness, just as we speak of the sense of beauty, or shame, the moral sense, the sense of humour. But the sense

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of fourth-dimensional existence would differ *toto coelo* from any of these "senses." They are states of consciousness which have varied immensely even during the historic period of man's history, and which vary greatly even among contemporaries; they are but diverse attitudes, as it were, of the same mind: but this new "sense" would be a total transformation in the very nature of consciousness, and there is really no evidence in the past history of the world, which would lead us to expect that such a momentous change would take place in the constitution of any organism, except by such infinitesimal stages as would practically postpone its effects till the Greek calends.

We are quite justified in saying that, considering the apparent immobility of space-conception from the first dawn of consciousness, any fundamental change in its character is, at any rate, out of the range of all useful speculation.

I dare say that somebody has discovered a new dimension of Time. Time, as we know it, has only one dimension—length. But I have no doubt that the Scientific Romancer would have little difficulty in showing us the narrowness of this conception of time. He might ask us to imagine a being whose time-consciousness had no dimensions at all, with whom time was but a lengthless and no-dimensional point; who was conscious of no succession in his ideas or sensations, but dwelt in Carlyle's Eternal Now. Such a being, he might argue, would be totally unable to conceive of any such dimension of time as length; and hence he might point out our obtuseness in denying the thickness of time.

And, indeed, if Space has an inconceivable fourth-dimension, Time may very well have an inconceivable second-dimension.

There is one point upon which we have not yet touched. It is suggested that, although the cubical apprehension of space may be a necessity of the human mind, yet there may exist other minds than ours to which space appears in an aspect of four dimensions. This is like saying that there may be inhabitants of the planet Mars "whose heads do grow beneath their shoulders." For we do not even know that the inhabitants of Mars, if there are any, possess heads at all; and certainly we have no shadow of a reason for supposing that any other minds than ours are weighted with any such conditions of space and time as those which fetter the human intellect. How do we know that associations of succession and extension are *necessary* characteristics of mind? It is impossible to maintain that the whole idea of the word "mind" is wrapped up in its consciousness of space and time; and, if this is not so, that consciousness may be a purely accidental quality.

Let us not imagine that this transcendental geometry, which treats of other dimensions than are known to experience, is confined merely to a few isolated fad-mongers. It has more claims upon our attention. It is the doctrine of a school of thinkers which contains many eminent names and has produced a considerable literature, and which, though it does not thrive, I believe, in our English atmosphere, commands a large Continental

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suffrage, in Russia, in Italy, and especially among the smoky philosophers of the Fatherland. The great names in this school are those of Riemann and Helmholtz, Beltrami and Lobatschewsky. Among English men of science, I think I am right in saying that Professor Tait, Professor Sylvester, and the late Professor Clifford are among the converts of the new faith. If it were not that names no less weighty than these are to be found among the conservative mathematicians, one would not be so bold in disputing the radical doctrine. But, as I have endeavoured to show, the foundation upon which that doctrine is based appears to me nothing but a shifting quicksand. After announcing their faith in empiricism, transcendental geometers proceed to use language of this kind: "All that we know of space and its properties is what we are taught by sensible experience." Now, this way of talking about space, as if it were a physically real thing, an object of sensation, with "properties" which may be investigated by physical means, appears to me to be just such a confusion between ideas and facts as might well lead to the cataclysm of the Dunciad.

We all admit, I suppose, the empirical origin of our conception of space: by which we mean that experience or habit has moulded the human mind into such a form that it cannot help regarding phenomena as spatially extended in three directions. The new school maintain that, while experience has certainly done this, it might have done something else: it might have moulded the mind into other forms. And it is just at this point that the confusion of thought, to which we have alluded, seems to invade their position. For they proceed to interpret these other possible forms of mind *by the light of the existing form*, and speak of them in terms of space. Indeed, they actually call them species of space. The existing form they term homaloidal or flat space, with a curvature equal to zero, which is the space of Euclid, and assume the existence of two other forms, which are the spaces of Lobatschewsky—spherical space, with a positive curvature, pseudo-spherical space, with a negative curvature: that is, as I understand, they imagine kinds of space which are not *same* as our space appears to be, but in which figures alter their shape by altering their position. Surely they can only reach these assumptions by confusing subjective forms of mind with objective phenomena. If space is a form of consciousness educed by experience, space has no objective existence, but is only a name for that form of mind. To say, then, that there may be other forms of mind which conceive space differently is absurd. If A equal B, C and D cannot equal A without being equal to B.

This is the logical charge to which the new school lay themselves open by basing their doctrine upon empiricism. Their only logical position is ontological—viz.: that space has an objectively real existence, independent of experience; but this position neither Riemann nor Helmholtz, nor any of the school, so far as I am aware, have taken up, and certainly some of the most eminent, such as Professor Clifford, would be the last men in the world to have resort to this abandoned fortress. Yet it is quite

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obvious that their assumption of empiricism is unsound. It is as transparent as the little fiction of those piratical islanders who reported that they earned a precarious livelihood by taking in one another's washing.

And now, as I began this paper with a confession of ignorance, so I cannot bring it to a close without tending my apologies to those who may have studied this subject more fully than I have done, for having inflicted upon them such a long, yet insufficient, discourse. I hope, however, that I have made clear my own reasons, such as they are, for refusing to install Lobatschewsky in that chair of authority from which Euclid has subjugated the intellect of twenty centuries.

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THE INFLUENCE OF THE GEOLOGICAL FEATURES OF A DISTRICT ON THE HEALTH OF ITS INHABITANTS.

By C. A. Moore, M.D. (Read before Section "C.")

In the following short paper it is my intention to present a few instances where the Geological character of a district influences its health. First of all it will be well to consider the kind of formation chosen as sites by the earliest civilised people in our own country.

It has been remarked by Mr. Topley, of the Geological Survey, that the outcrops of some Geological formations are marked by the occurrence of numerous villages, while certain neighbouring formations are almost without any. Mr. Prestwich remarked that London was first peopled upon its gravel-bearing surfaces, because these readily yielded good water.

In the County of Rutland it is interesting to notice how the presence of springs has determined the sites of villages. Thus along the two great escarpments there are two series of villages which obtain their water supply from the springs—at the junction of the Inferior Oolite and upper Lias, and also at the junction of the Marlstone Rock bed and Middle Lias clays respectively. Along the sides of the river valleys of this district, several villages exist, which depend for their water supply on the springs arising from the various Oolite beds.

In the drift covered area, to the west of the County, the position of the villages is generally determined by beds of gravel, yielding springs. The position of these villages was, no doubt, in the first instance, determined by the ease with which water could be obtained at these spots, and as the villages increased in size, it became necessary to supplement the water supply by sinking wells.

With respect to the influence of soils upon the health of the people living upon them, sandy and gravelly soils are always healthy sites, except when they are low-lying, and thus become water-logged. In soils of this kind a persistently low ground water level is always healthy; a persistently high level is unhealthy, and when the ground water level fluctuates suddenly and considerably, it is more unhealthy still. Low-lying, clayey soils, are unhealthy, and favour the development of phthisis, rheumatism, and colds; and with regard to Geological strata generally, those which favour the retention of moisture are unhealthy, while those which are dry are healthy sites.

If a soil, in addition to being damp, is polluted by leakage from defective drains or cesspools, the bad effect is increased, and such diseases as diarrhœa, typhoid fever, and cholera, are spread amongst the dwellers on such sites, either by consumption of polluted well water, or by breathing polluted air.

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Soil not only acts as a mechanical filter, but it has been shown by a series of experiments, at Rothampstead, that sewerage undergoes a process of nitrification, that is to say, in its passage through the soil, it meets with minute organisms which cause an oxidation of the ammonia and other nitrogenous bodies into nitrates and nitrites. It is probably owing to this change, effected by a porous soil upon the liquid filth percolating through it, that people are sometimes able to drink with impunity the water from a well which is obviously exposed to pollution. There is, however, always great risk that the soil in the neighbourhood of such a well may be overtaxed with filth, and that some portion of the polluting liquid may escape complete decomposition. There is in fact no evidence that percolation through the soil, even if it has the power of rendering harmless the organic matter which may give rise to sporadic outbreaks of fever, has any effect on specific poisons or germs.

The famous case of the Lausen outbreak of typhoid fever points to an opposite conclusion, and is interesting chiefly as shewing that no amount of percolation, no matter how efficient, will keep back the typhoid poison. The distribution of certain diseases largely depends upon the absence or otherwise of valleys and rivers, along which the wind can sweep without interruption. Mr. Haviland says, after years of study in this matter, that those counties on the sea coast most exposed to the prevailing winds have the least mortality from heart disease; whereas, those coastal counties, such as those which have barrier-like rocks, which interfere with the full sweep of the sea winds, have a high mortality. There is a lower mortality when the coast line is broken by inlets communicating with valleys in the interior. The highest mortality from heart disease is coincident with the lowest exposure to sea air, and the lowest mortality from heart disease is coincident with the greatest amount of exposure. The counties which lie between these extremes are shewn to possess an intermediate death-rate. Mr. Haviland has worked out these conclusions with great care.

With respect to phthisis, or consumption, Dr. Buchanan examined three of the Southern Counties of England with regard to the distribution of the disease. His conclusions are as follows:—"Within the Counties of Surrey, Kent and Sussex, there is less phthisis among populations living on porous soils, than among populations living on impervious soils. Within the same Counties there is less phthisis among populations living on high-lying pervious soils, than among populations living on low-lying pervious soils. Within the same Counties there is less phthisis among populations living on sloping impervious soils than among populations living on flat impervious soils."

It may therefore be concluded that wetness of soil is a cause of phthisis or consumption to the population living upon it. It is satisfactory to know that the truthfulness of this conclusion has been proved by the great lowering of the death-rate where districts have been sewered and drained. A similar conclusion has been arrived at by Dr. Bowditch, of Boston, U.S., as the result of very extended inquiry.

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ON MR. JOHN PLANT'S CATALOGUE OF LEICESTERSHIRE MOLLUSCA.

By F. T. Mott, F.R.G.S. (Read before Section "D.")

About the year 1845, the late Mr. T. R. Potter, of Wymeswold, author of "The History and Antiquities of Charnwood Forest," undertook to prepare a new History of the County of Leicester, based, of course, upon the great classical work by Nichols, but to be mostly re-written, to be arranged in a much more systematic manner, and to contain such additional information as had been accumulated during the half-century which had elapsed since the date of Nichols's publication.

Mr. Potter had made elaborate arrangements for the carrying out of this great work. He was himself a scholar, an antiquarian, and a practised writer. He reserved the historical part for his own pen, and placed all the other branches of the subject in the hands of experts.

The first volume was to be devoted to the Natural History of the County, and the several departments were undertaken by the following gentlemen, viz. :—

The Geology, by	Professor Ansted.
The Botany, by	The Rev. A. Bloxam. The Rev. Churchill Babington. The Rev. W. H. Coleman.
The Birds, Mammals, and Reptiles, by	Mr. James Harley. The Rev. Arthur Evans.
The Beetles, by	Mr. F. Bates.
The Mollusks, by	Mr. John Plant.
The Spiders, by	Rev. Hamlet Clarke.
The Butterflies and Moths, by	Mr. W. F. Kirby.
And the Agriculture, by	Mr. George Kilby.

This admirable staff of collaborateurs laboured at their respective tasks for some five or six years, but Mr. Potter was never able to get his great work printed, and with one exception, all that was done remains in manuscript to this day.

The Geology of the County, by Professor Ansted, was published as a First Part of the projected work, and was in every respect worthy of its position, but it is the sole representative to the world at large of a grand design which collapsed before even its main walls and pillars were erected. Our Society is doing useful service in bringing to the light some of the long hidden MSS. The Botany prepared by Bloxam and Coleman, forms the basis of the County Flora now in the Press. Mr. Harley's Notes upon the Mammals of the County are in the hands of Section "E," and I now lay before you, the members of Section "D," Mr. John Plant's Catalogue of the Mollusca.

The name Mollusca was applied by Aristotle to the Cuttle-fishes, Linnæus adopted it for his group of soft bodied animals, which included the Worms, Polyps, Sea Slugs and Urchins, but the modern class was first established by Cuvier, whose definition of it is still accepted.

It has been found, however, that some of his sections do not accord with that definition. The Lamp Shells, Ascidians and Barnacles have been eliminated by recent investigations, and the class is now limited to the Cephalopoda or Cuttles, the Gastropoda or Univalves, and the Lamellibranchia or Bivalves.

The Cephalopods, or Cuttles and Nautili, are the most highly developed, having distinct heads, and well formed eyes, with the foot surrounding the head and divided into lobes for swimming and siezing food.

The Gastropods have also heads, and eyes less highly developed, with the foot attached to the under surface for crawling, and a spiral shell of one valve. The Lamellibranchia have no heads, a foot formed for burrowing in mud or sand, not for crawling, and a shell of two valves. They are considered to be a degenerated branch in which the head is aborted.

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Of these three Sections the Cephalopoda are entirely marine, and therefore are not represented in this inland County. The Lamellibranchia are entirely aquatic, and therefore all Leicestershire species are confined to the ponds and streams. Of the Gastropods some are aquatic and some terrestrial—the majority of our species naturally therefore belong to this Section.

Of the British Land and Fresh-water Univalves, Gray makes thirty-five Genera, while Rimmer—a more recent writer—makes twenty-six only. Of the Bivalves, Gray makes six Genera and Rimmer five. They agree, however, in making about one hundred and thirty species as the total number occurring in Britain.

Mr. Plant, in common with both these writers, adopts the classification of Dr. Gwyn Jeffreys, in his British Conchology. In the article "Mollusca," in the ninth edition of the "Encyclopedia Britannica," which was written by Professor Ray Lankester, and published several years later than Rimmer's book, a new and different classification is adopted. According to Rimmer, of the one hundred and thirty-one known British species, one hundred and sixteen are Univalves and only fifteen Bivalves. Mr. Plant's Catalogue records seventy-five out of the one hundred and sixteen Univalves, and eleven out of the fifteen Bivalves, as occurring in this County —or 65 per cent. of the total; but there are four of his species which are scarcely entitled to a place in our local fauna.

These four are, *Helix pomatia*, the edible Snail, of which colonies were imported at Calke Abbey, just outside the County, and at the Collegiate School Grounds, in Leicester, but which have since died out; *Helix virgata*, chiefly a sea side form, but to which some young dead shells, among the *debris* of a flood, were doubtfully referred; *Succinea oblonga*, supposed by Rev. A. Bloxam to have been found in the River Sence, but which Mr. Plant thinks was probably the young of *S. putris*, *oblonga* being chiefly a sea side species; and *Succinea Pfeifferi*, which both Gray and Rimmer regard as a synonym of *putris*.

Eliminating these four, the Catalogue of Leicestershire Mollusca amounts to eighty-two species. Mr. Plant's list was completed in 1850, and I am not aware that any new species have been discovered since that date, although it is possible that several others may yet be added.

Mr. Plant is a member of a well-known Leicester family, long distinguished for its scientific tendencies. At the date of this Catalogue, he was Secretary to the Leicester News Room and Permanent Library. He has for many years been the Curator of the Royal Museum and Free Library, Peel Park, Salford, and a Fellow of the Geological Society of London.

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THE LAND AND FRESH-WATER MOLLUSCA INDIGENOUS TO LEICESTERSHIRE, 1850.

By John Plant.

Fool.—Canst tell how an oyster makes his shell?
Lear.—No.
Fool.—Nor I neither; but I can tell why a snail has a house.
Lear.—Why?
Fool.—Why to put his head in.
—*King Lear*, Act I., Scene 5.

PREFACE.

In endeavouring to make our acquaintance with the Land and Fresh-water Mollusca indigenous to the County as complete as possible, I have availed myself of every opportunity to collect in every district, for a period of about six years, and have succeeded in finding eighty-three out of the one hundred and thirty species known to inhabit Great Britain.

In this, as in many other departments of nature, while generally land and fresh-water shells may be said to be found almost everywhere, different species inhabit different geological formations, and frequent different soils and localities. On the calcareous and arenaceous oolites, which form the eastern border of the County, we find some interesting and well-marked shells—*Cyclostoma elegans*, *Helix arbustorum*, *caperata*, and *Cantiana Clausilia bidens*, and *Segmentina lineata*, which we shall perhaps never find frequenting the Lias, New Red Sandstone, or Grauwacke districts in other parts of the County. On the narrow band of Lias which, by its western escarpement, severs the County into two nearly equal parts, will be found several other shells, such as *Helix lapicida*, *hortensis*, and *hybrida*, which flourish on its limey lands, and are seldom found beyond its borders on the West. On the broad varied surface of the New Red Sandstone, from the valley of the River Soar to the extreme western edge of the County, we find more than fifty species which affect damp grassy meadows and marly lands, hedge bottoms and gravel banks, while on the higher land and barren rocks of Charnwood Forest and the adjoining coal-field, together with the small knolls of mountain Limestone to the north, are to be found a few more local species, such as *Helix lapicida*, *Pupa umbilicata*, *Bulimus obscurus*, *Clausilia nigricans*, *Achatina acicula*, and *Azeca tridens*, together with some singular varieties of the more common species of *Helix*, *Zonites*, and *Limnæa*.

The distribution of the fresh-water species is not so subjected to peculiarities, for the quiet character of our sedgy rivers and canals, the pools and ponds of any size, are too uniform and connected, to localize any of its inhabitants to one stream in preference to another, and I believe that the aquatic species will be found to exist throughout the

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whole County, only subject to varieties influenced by such causes as the depth of the water and its richness in aquatic plants.

The only published notices of our local species of shells with which I am acquainted, are the list made some fifty years ago by the poet and divine, the Rev. George Crabbe, B.D., and one published in the "Analyst," in 1836, by the Rev. Andrew Bloxam, M.A., and to such species as have been recorded by them, I have in the present notice affixed the initials C. and B. As the short list given by the Poet may not be generally known, and is interesting from the species having been all collected in the immediate vicinity of Belvoir Castle, I have extracted the whole of his notice from the voluminous and almost inaccessible volumes of the great historian of the County (Nichols, Vol. I., p. cxci.), with a view to contrast the small number of Mollusca known to that excellent observer of nature and the number known at present.

BIVALVES.

MYA PICTORUM -	*S.N.*, 1112. In the Devon plentifully.
TALLINA CORNEA -	In ponds and ditches.
MYTILUS ANATINUM-	In the Devon and other streams.
„ CYGNEUS -	Not immediately in the Vale, but lower down the Devon near the junction with the Trent.

UNIVALVES.

NAUTILUS- - - -	Mr. Lightfoot found a small species in fresh-water in a pond where the Bur-reed grows.
TURBO BIDENS - -	*S.N.*, 1240. In woods about Belvoir.
„ PERVERSUS -	In moss and old trees.
HELIX PLANORBIS -	In ponds, and River Devon.
„ VORTEX - -	In ponds; not common.
„ ALBELLA - -	Ant hills and hedges.
„ HORTENSIS -	Garden Snail.
„ ARBUSTORUM-	About Belvoir.
„ VIVIPARA -	Ditches.
„ ZONARIA -	Ribband snail; very common.
„ STAGNALIS -	Very large at Goadby.
„ PUTRIS - -	Ponds.
„ AURICULARIA	Ponds.
„ TENTACULATA	Ponds.

Several varieties of these Snails, particularly the *Zonaria*, are found about Belvoir Castle.

In the preceding list of eighteen species there are no less than three of them—*Nautilus (Segmentina lineata), Turbo perversus (Balœa perversa), Helix arbustorum*—which may even at the present time be considered of rare occurrence in the County. The Paper by the Rev. A. Bloxam, "British Land and Fresh-water Shells found in the vicinity of Congerstone, Leicestershire, in 1835-6," &c., enumerates forty-three species as occurring in that locality, and mentions a few others which were known

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to exist in other places in the County; to this number I have now added forty more species, as the result of my labours in this engaging branch of Natural History; but there remains still to discover one or two others, which from their habits and geographical range, we may naturally expect would be met with in some parts of the County, although I have hitherto searched for them in vain. I can have no doubt but that a careful re-examination of the district of Charnwood Forest would produce *Helix aculeata*,* *Vertigo palustris*, *Limneus glaber*, and one or two species of *Pisidium*.

MALACOZOA.

Class—GASTEROPODA.

The arrangement of the Gasteropodous Malacozoa, which embraces a great number of species indigenous to the sea, fresh-water, and the land, has been facilitated by division into several Orders: 1, Pulmobranchiata; 2, Pectinibranchiata; 3, Tubulibranchiata; 4, Sentibranchiata; 5, Cyclobranchiata; 6, Inferobranchiata; 7, Tectibranchiata; 8, Nudibranchiata; 9, Cirrobranchiata.

The species which are terrestrial or found inhabiting rivers, lakes and ponds, are included in the two first Orders—Pulmobranchiata and Pectinibranchiata; the other Orders are composed of species inhabiting the sea or brackish waters.

Order—PULMOBRANCHIATA.

Family—ARIONIDÆ.

The species of this Family are phytophagous, or vegetable eaters, and are familiarly known as slugs and snails. They are chiefly to be observed in the morning and evening, or after rain, but retire to the shady leaves of thick herbage, under stones and logs of wood during the middle of the day; and in winter they bury themselves in the ground and remain torpid till the following spring.

1. ARION ATER, *Gray's Turt.* Black Slug. Very common in damp grassy ditches, and in willow-beds. Varieties of red, yellow and yellowish white are very common.
2. A. HORTENSIS, *Fér.* Garden Slug. In damp woods, not nearly so plentiful as *A. ater*.

Family—HELICIDÆ.

3. LIMAX MAXIMUS, *Linn.* Great Slug. This slug is the common slug that affects dark and damp places in cellars and about houses, and holds about the same relation to and dependence upon man as do the rats and mice among the higher animals.
4. L. AGRESTIS, *Linn.* Field Slug. In fields, gardens and grassy spots. Varies from a dull white to a reddish brown. A variety is found at Bradgate of a slate colour, with a darker line down each side.

* *Helix aculeata* has been since found in Gopsall Wood and also in the Orchard, Gopsall, by the Rev. A. Bloxam; he has also added *Planorbis imbricatus* to the list, from a pond on the Appleby Road, near Twycross.—May, 1850.

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5. L. FLAVUS, *Linn.* Variegated Slug. Beneath turf and in damp places by walls, and more rarely in cellars.
6. HELIX ASPERSA, *Mül.* Spotted Snail. Abundant throughout the County. It feeds upon vegetables and fruit, infesting currant and gooseberry bushes when the fruits are ripe. Crabbe makes no mention of this species, unless under the name of *H. arbustorum*, of which mollusc no specimens have been found near Belvoir since his time. *B.*
7. H. HORTENSIS, *List.* Garden Snail. Varieties entirely deep yellow, pale yellow, and marked with from one broad band up to five narrow ones. In all districts west of the river Soar it is found but sparingly; abounds most on the oolites of the east side of the County. Mr. Samuel Seddons found it abundant on hedge sides near Melton Mowbray. *C. B.*
8. H. HYBRIDA, *Poiret.* Hybrid Snail. Two specimens of this doubtful species, found near Great Easton.
9. H. NEMORALIS, *Linn.* Field Snail. The commonest species of *Helix*, found in fields, woods, gravel banks, lanes, &c. The almost endless varieties of colour are dependent upon food and the character of the spot where they are procured. Those shells which have the most decided colours and with the five bands well defined, always exhibit yellow, reddish and brown. Crabbe does not mention this species, unless as *H. zonaria*. *B. C.*
10. H. POMATIA,* *Linn.* Edible Snail. In the year 1832, a colony of this species was placed upon the limestone district about Calke Abbey by the Rev. A. Bloxam, and in 1845 a number were also turned adrift in the vicinity of Leicester, but it does not appear that either colonies have flourished, as in no instance have I ascertained that living specimens have been found, while the dead shells are occasionally picked up near the above localities.
11. H. ARBUSTORUM, *Linn.* Shrub Snail. Very local. On the knolls of carboniferous limestone at Breedon, Staunton Harold Park, Gracedieu Abbey. Crabbe gives Belvoir Vale as a locality where he found it, but this is more than doubtful, *vide sup.*, for it is indigenous to limestone districts. *C. B.*
12. H. LAPICIDA, *Linn.* Rock Snail. In similar localities with the above, and at Thringstone. Not common. *B.*
13. H. PULCHELLA, *Mül.* Pretty White Snail. Smooth specimens may be found abundantly at the roots of grass and amongst moss in the meadows by the river Soar. *B.*
14. H. FULVA, *Mül.* Pyramidal Snail. Very local. Under decayed wood at Swithland Wood, *débris* of floods. *B.*

* In a note, page 467 of Nichols's "East Goscote," occurs the following:—"I am told that the great snail, or *Pomatia* ('Brittish Zoology,' Vol. iv., No. 128), is found in the neighbouring woods, which is its most northern residence in this island. It is of exotic origin. Tradition says it was introduced by Sir Kenelm (Digby) as a medicine, for the use of his Lady (Venetia Stanley)." —T. R. POTTER.

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15. H. CANTIANA, *Mont.* Kentish Snail. On sandy soils and hedge banks about Saltby, Sproxton, Melton.
16. H. ACULEATA, *Mül.* Spiny Snail. On decaying sticks in the Orchard, Gopsall, also in Gopsall Wood, near Twycross. *B.* Curious, from the epidermis rising into thin spinous foliations.
17. H. HISPIDA, *Mül.* Bristly Snail. This and the two following species are so nearly allied that, in an extensive series of specimens, it is quite easy to find some individuals which partake of the specific character of each. They occur together, and, if examined under the most favourable circumstances, before they have been handled, individuals may be picked out entirely denuded of hair, but otherwise not differing from *hispida*, and others with closely set shortish hairs, agreeing with *concinna*. My specimens of *H. hispida* form themselves into seven pretty distinct varieties; the mouth is thin in all, the extremes of colour are dull white and dark brown, but the band, when present, is lighter than the other parts of the shell. Found abundant in willow-beds, damp moss, and under stones on the Forest. *B.*
18. H. CONCINNA, *Jeff.* Neat Snail. My specimens of this species are all distinguished by having a strong white enamelled rib round the interior of the mouth. Dark or red brown, sometimes banded. Found in similar places to the above.
19. H. DEPILATA, *Pfei.* Bald Snail. Occasionally found with the above.
20. H. RUFESCENS, *Penn.* In *débris* after a flood. Abbey Meadows.
21. H. VIRGATA, *Mont.* Three specimens in *débris* after floods, 1843.
22. H. CAPERATA, *Mont.* Wartnaby oolite stone quarries, 1847.
23. H. ERICETORUM, *Müll.* Abundant in the Lias quarries of Barrow-upon-Soar, Seagrave, and about Melton Mowbray. *B.*
24. ZONITES RADIATUS, *Leach.* Radiated Zone-snail. Very common. Under stones and felled timber on Charnwood Forest. *B.*
25. Z. UMBILICATUS, *Gray.* Umbilicated Zone-shell. Rather rare, at the foot of rocks on Mountsorrel; Abbey walls.
26. Z. PYGMÆUS, *Gray.* Rare, Aylestone Church-yard. The Rev. A. Bloxam found several specimens on the banks of Carlton brook after a flood.
27. Z. ALLIARIUS, *Gray.* In woods, under decayed leaves in all damp spots; in winter under bark. Gopsall Wood. *B.*
28. Z. CELLARIUS, *Gray.* Common in damp shady spots by walls, under stones. Bradgate, &c. *B.*
29. Z. NITIDULUS, *Gray.* Plentiful on the banks of the Soar, in 1845.
30. Z. LUCIDUS, *Gray.* In situations similar with the above, but not so common. *B.*
31. Z. EXCAVATUS, *Bean.* Found on the willow stumps below the Castle Mount; Benscliff Wood.
32. Z. CRYSTALLINUS, *Leach.* Common at the roots of grass about Saint Mary's Mills; under moss on walls at Leicester Abbey. *B. C.*

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33. VITRINA PELLUCIDA, *Flem.* Glassy Shell. Under moss in Spring. Sheet Hedges and Buddon Woods. Local. Low grounds adjoining Carlton brook. *B.*
34. SUCCINEA PUTRIS, *Flem.* On *Nymphæa* and *Iris Pseudacorus* in the river Soar; sedgy banks of Groby Pool. *B. C.*
35. S. PFEIFFERI, *Ross.* Abundant in similar places, but generally it is difficult to be satisfied that these two species are really distinct.
36. S. OBLONGA, *Drap. (?)* The Rev. A. Bloxam puts this species down as found by him in the Carlton brook and river Sence. I have many specimens of the young of *Pfeifferi*, which, without comparison with the true *S. oblonga*, would be easily mistaken for that species. I have not taken any distinct specimens of *S. oblonga* in the County.
37. BULIMUS OBSCURUS, *Drap.* Two specimens were found in Ansty Lane by Mr. T. B. Kirby, in 1846, and I have taken three others in different places since. It is rather uncommon.
38. ZUA LUBRICA, *Leach.* Found in great profusion in *débris* of floods, in the crevices of walls, about water-mills and bridges. *B.*
39. AZECA TRIDENS, *Leach.* Glossy Trident Shell. Very rare. Two specimens at Gracedieu Abbey, 1849.
40. ACHATINA ACICULA, *Lam.* On the limestone rocks of Breedon; Gracedieu.
41. PUPA UMBILICATA, *Drap.* Very plentiful on the walls of the stables in Bradgate Park.
42. P. MARGINATA, *Drap.* Three specimens from near Aylestone bridge, 1847.
43. VERTIGO EDENTULA, *Gray.* Toothless Whorl-shell. A few specimens from the roots of grass, near Leicester; in Gopsall Wood. *B.*
44. V. PYGMÆA, *Fér.* Bradgate Park, in *débris* of floods; near Congerstone. *B.*
45. BALÆA PERVERSA, *Flem.* Moss-shell. One specimen from moss off the wall at Bradgate. *C.* Also at Breedon Hill. *B.*
46. CLAUSILIA BIDENS, *Drap.* One specimen from a ditch near the Spinney Hills. In woods about Belvoir (?). *C.*
47. C. NIGRICANS, *Jeff.* Abundant on the walls at Bradgate, Gopsall, and other ruins. *C. B.*

Family—AURICULIDÆ.

48. CARYCHIUM MINIMUM, *Mül.* Meadows and banks of the Soar, after floods. *B.*

Family—LIMNÆADÆ.

49. LIMNÆUS AURICULARIUS, *Drap.* Some remarkably distinct and beautiful specimens of this mollusc were taken from Osbaston Pool, the outer lip being turned completely back. *C. B.*
50. L. PEREGER, *Drap.* An endless number of varieties may be collected from different localities. The largest and normal specimens are

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found in old ponds and sedgy parts of the rivers, whilst the smallest and generally deformed specimens occur in the little ponds of rain-water which are found after heavy rains on Charnwood Forest.

51. L. STAGNALIS, *Drap.* River Soar, old ponds and quiet ditches. Fine specimens are found, near Market Bosworth, two inches long. *C. B.*
52. L. PALUSTRIS, *Drap.* In river Soar and ditches.
53. L. TRUNCATULUS, *Jeff.* Common in river ditches and small brooks throughout the County. *B.*
54. ANCYLUS FLUVIATILIS, *Müll.* Bradgate brook, river Soar, and ponds. *B.*
55. VELLETIA LACUSTRIS, *Gray.* Groby Pool, River Wreake, and under stones in the Forest brooks. *B.*
56. PHYSA FONTINALIS, *Drap.* Plentiful in the large pond and ditches in the Leicester Abbey Gardens. *B.*
57. APLEXUS HYPNORUM, *Gray.* This Mollusc has only occurred to me once, and then in great numbers; it was found in a stagnant ditch on Welford Road, Leicester, but the spot is now filled up and built upon. *B.*
58. PLANORBIS CORNEUS, *Drap.* Common in the rivers, and large quiet ponds. *C. B.*
59. P. ALBUS, *Mül.* Ditches and ponds about the Leicester Abbey Meadows, on acquatic plants. *B.*
60. P. CARINATUS, *Mül.* Rivers and sedgy ditches. *B.*
61. P. MARGINATUS, *Drap.* With the above, but more abundant. *B.*
62. P. VORTEX, *Mül.* River Soar and large ditches. This seems to be the most abundant species of the genus. *C. B.*
63. P. SPIRORBIS, *Mül.* Abundant in stagnant ditches and ponds. *B.*
64. P. NITIDUS, *Mül.* Local, in a ditch flowing from the fish ponds at Bradgate Park; pond at Bosworth Park.
65. P. IMBRICATUS, *Drap.* Abundant in a small pond on the Appleby Road, near Twycross. *A. B.*
66. P. CONTORTUS, *Mül.* In small stagnant ditches; River Sence, near Congerstone.
67. SEGMENTINA LINEATA, *Flem.* This is the species mentioned in Crabbe's list as a *Nautilus*, found by Mr. Lightfoot, in a pond where the Bur-reed grows, in the Vale of Belvoir. The publication of this discovery was made by Mr. Lightfoot in the "Philosophical Transactions," Vol. XXVI., pl. 1, figs. 1 to 7. I have not been able to meet with it myself in any of the ponds and dykes I have examined, yet I doubt not it exists and may be found in ponds in the eastern side of the County. *C.*

Family—CYCLOSTOMIDÆ.

68. CYCLOSTOMA ELEGANS, *Drap.* I am indebted to my friend, W. J. Woodcock, Esq., of Melton Mowbray, for this addition; he found

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living specimens on the oolite limestone districts near Buckminster and Sewstern. At the distance of a few miles beyond the borders of the County, at Great Ponton, in Lincolnshire, it was found in abundance.

Order II.—PECTINIBRANCHIATA.

Family—NERITIDÆ.

69. NERITINA FLUVIATILIS, *Lam.* In the gravelly places and on sunken piles in the River Soar. It is seldom found in those places where the contents of the dye houses and gas refuse discolour and poison the water below the town, although the *Planorbs* and *Limnææ* thrive and multiply in the blackened waters; a variety marked with dark bands on a yellow ground is sometimes found.

Family—PALUDINIDÆ.

70. PALUDINA VIVIPARA, *Lam.* I am induced to add this species to the list from having received a few specimens, which were gathered from heaps of *debris* spread over the Abbey Meadows after a heavy flood in the River Soar; but I have never collected it alive when dredging in the Canal or River. *C.?*

71. P. ACHATINA, *Brug.* Very abundant in the River Soar and Canals. *B.*

72. BITHINIA TENTACULATA, *Gray. Tentacled Bithinia.* This species is to be found in myriads throughout the River Soar and the Canals. It is a well-defined Shell, and the least subject to variety of any of our fresh-water Molluscs, yet it has been singularly unfortunate in the hands of some conchologists who have described and figured it. No one would conceive it possible that such different figures of this Shell, as are to be found in Gray's Edition of "Turton's Manual;" Pennant's "British Zoology," IV., p. 140, pl. 86, fig. 140; Sowerby's "Conchological Manual," fig. 537; Brown's "Illustrated Land and Fresh-water Conchology of Great Britain," pl. 1, figs. 8 and 9, could possibly be referred to one species. The figure in Gray's is very correct, agreeing with thousands of specimens which I have collected in the County. I have taken two specimens from the Abbey Moat, which differ from others in being larger and more strongly made, in having the inner edge of the lip strongly enamelled and a strong line of growth on the last whorl. As this variety is unusual, I have added a drawing of it, with the operculum. *B.*

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73. B. VENTRICOSA, *Gray. Ventricose Bithinia.* Occurs sparingly among the *debris* of floods, and in the Aylestone Brook. *B.*

Family—VALVATIDÆ.

74. VALVATA PISCINALIS, *Lam.* Found in the river near the Abbey and the Castle; Canal, at Loughborough, Ashby, &c.; Bosworth Mill. *B.*

75. V. CRISTATA, *Mül.* Rare; four specimens from the Reservoir, Charnwood Forest, and Groby Pool.

Order I.—LAMELLIBRANCHIATA.

Class—TROPIOPODA.

The number of fresh-water species of this Class is very limited in Great Britain, there being not more than sixteen well authenticated species known; of these, ten have been found in the County of Leicester, dispersed throughout the extent of the rivers and canals. They seem not to be possessed of much voluntary locomotion, and, if it were not for the sweeping character of heavy floods, would remain for many years attached to the same locality. Their food consists of animal and vegetable substance.

Family—CYCLADÆ.

76. CYCLAS RIVICOLA, *Leach.* The canals and rivers throughout the County appear to be very suitable to this species, as everywhere very fine specimens are to be found. *B.*

77. C. CORNEA, *Lam.* Plentiful in small streams. *B.*

78. PISIDIUM OBTUSALE, *Pfeif.* Sparingly in small ponds and ditches near Leicester, in 1849.

79. P. PUSILLUM, *Jen.* Rare. The Rev. A. Bloxam records this as found near Market Bosworth. I have never met with it.

80. P. PULCHELLUM, *Jen.* This occurs but rarely in small ditches. *B.*

81. P. AMNICUM, *Jen.* Frequently to be found near mills and in the River Soar. *B.*

Family—UNIONIDÆ.

82. ANODON CYGNEUS, *Turt.* Extremely common in all parts of the River Soar, Canals, Groby Pool, and large ponds throughout the County. In company with my friend, the late Rev. A. Evans, we dredged the old pond of Osbaston Hall, and collected some very fine specimens. One shell (var. *cellensis*) measured seven and a half inches in breadth and four inches and one-eighth in length. (It is yet, 1886, in my collection.) A fine series of specimens of a thick variety *(ponderosa)*, having external wrinkles deep and irregular, were also taken. The shell does not reach to so great perfection in the river as in quiet old ponds. *C. B.*

83. A. ANATINUS, *Linn.* Common in the same localities as the last, and by some considered as only a variety of it. *C. B.*

84. UNIO PICTORUM, *Lam.* Plentiful in the River Soar, at Cossington and Barrow mills, and Normanton Turville. *C. B.*

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85. U. TUMIDUS, *Retz.* Very common in the river Soar, all the canals and large pools. These two species are undoubtedly distinct, but, influenced by the character of the water they inhabit, are liable to much variation in shape and colour. I have collected specimens in the County which agree exactly with the descriptions of *U. Deshaysii, rostrata, elongata* and *solida* of Turton.

Family—DREISSENADÆ.

86. DREISSENA POLYMORPHA, *Pallas.* The discovery of this wanderer from the Volga and the Danube in the canal locks near Leicester, was made by my friend, Mr. James Harley, in 1843. It is now moored in myriads to the sides of the locks and timber in all the canals throughout the County. *B.*

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NOTES ON THE BRITISH BIBIONIDÆ.

By W. A. Vice, M.B. (Read before Section "E.")

This is a family allied to the *Tipulidæ* (the Crane-flies, etc.,) and belongs to the second division of the Diptera, the *Nemocera*; having the antennæ, though comparatively short, composed of a number of almost equally developed joints; and in the pupa state the outlines of the different divisions and organs of the body are shown, thus differing totally from the other division, the *Brachycera* (the Blue-bottle may be taken as an example), in which no arrangement of parts is shown by the pupa.

There are, according to Walker, four genera in this family as represented in Britain. I believe two of these are now separated by Loew; and will not be touched upon in these Notes.

The two remaining genera are *Bibio* and *Dilophus*, the latter, among other distinctions, has eleven joints in the antenna as against nine in *Bibio*, but the most obvious difference is in the fore legs, the tibiæ of which are furnished with two spines or spurs on the outer surface, the upper one being bifid; and the tarsal extremity is widened out and armed with seven or eight spines.

Bibio has no spurs on the middle of the tibiæ, and the tarsal end is elongated into two spines, the outer one being much more developed than the other. Further remarks may apply to both genera.

The males of many species of flies have the compound eyes large, touching one another on the front, while the females are smaller and separated by a considerable interval; but in the *Bibionidæ* this is carried to the extreme, and the whole head of the female differs in shape from that of the male, which latter has the eyes so largely developed, that the globose head appears composed of them only; the apparent size being increased because of the dense growth of hairs which arise from between the facets.

In the female the head is slender and the eyes very small. Like the eyes, the whole body of the male is usually much more hairy than the female.

The wings are remarkable, the venation being but slightly developed, and while the costal and two other longitudinal veins are strongly marked and dark as usual, the rest are colorless or nearly so. This formation occurs in several other families, but in all other cases the flies are comparatively minute. The wings of the two sexes frequently differ, those of the male being whitish or clear, those of the female more or less brownish or blackened.

Another peculiarity is the different color of the sexes in some species. For example, in *B. hortulanus*, the male is black as all the males are,

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I believe, but the female is red with black legs. Several species differ conspicuously in the coloration of the legs. *B. Pomonæ* has the femora red, the rest of the legs being black; while in *B. Johannis*, and allied species, the legs are entirely red in both sexes, except the femora of the males.

Only two species of *Dilophus* are recorded by Walker; the most readily distinguishing mark being that the legs in both sexes of *Spinatus* are black, while the femora and fore cozæ are colored red in the female of *femoratus*.

The larvæ are said to feed on the roots of grass, like those of *Tipulæ*. They must abound in great numbers, different species being at times very abundant. Twice I have been fortunate to turn up the pupæ in garden soil. Early in May, 1885, I found pupæ contained as described by Walker, in "a smooth oval cell," formed in the rather tenacious loam. The flies emerged on the 10th of May and later, proving to be *Bibio Marci*. This year I also found some pupæ, which produced flies the last week in May and early in June, of a species which I have not been able to identify.

The males are very frequently to be seen dancing in the air, their legs in rather a curious position—the hind pair are hung vertically, the intermediate and fore pair being sloped backward to touch them. At times I have noticed the males of certain species, having selected a spot bare of herbage, and exposed to the rays of the sun, basking as it were in the heat, with their wings expanded; whereas their usual position is folded over the body, the one quite covering the other. I have numerous males but few females; this, I suppose to be because the males are such continuous hoverers, while the females remain on the herbage; but curiously from among the pupæ which I took last year, though several males emerged, I only obtained one female; and from those taken this year, five were males and two females. Nearly all are said to be vernal species; one to be autumnal only. *B. Marci* is so named because of its appearance about St. Mark's-day, as *B. Johannis* about St. John's-day. *Pomonæ* has two broods, being vernal and autumnal. Males of this I took in the first week in September, 1885, near Loch Awe, but found no females; also a male on Dartmoor during the last week in August, 1884. Males of *Johannis* are frequently very numerous in the early weeks of May. *Leucopterus* is plentiful at Blaby, or rather the males; I have only taken one female, on May 21st, this year. *Lanigerus* (one male), I have taken on Bardon Hill; I have several, taken at Blaby, which I have not been able to identify. Fourteen species are enumerated by Mr. G. H. Verrall.

Dilophus spinatus appears almost everywhere, and throughout the greater portion of the year; of *D. femoratus*, I had previously taken numbers of males, but at Braunstone, on June 10th, this year, the females occurred in great numbers, on the flowers of several of the *Umbelliferæ*.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE AND ECONOMICS.

The Section has held three meetings during the quarter, with an average attendance of 14 members. Maximum attendance, 20; minimum, 6.

October 12th.—The CHAIRMAN of the Section (Mr. W. JACKSON) read a paper giving a short account of some of the ancient buildings of Leicester.

He also called attention to new theories in Economic Science, regretting that he had not been able to find any member to take up the subject and give the Section a paper on the local aspects of our fiscal arrangements. He remarked that the Section is not giving any special attention to Numismatics; that the coins in the Museum and the "finds" constantly made are not receiving the attention they deserve. He also said an amateur photographer would be a very useful member of the Section.

The CHAIRMAN then called attention to the Jewry Wall, which he said was in need of protection from the weather; and he pointed out the desirability of having a drawing of the Roman pavement in Jewry Wall Street, shewing the additions which have recently been uncovered and annexed.

With reference to the last two subjects, the CHAIRMAN was requested to communicate with the Council of the Society.

November 9th.—Mr. C. J. BILLSON, M.A., read a paper on "Shakespeare's Library."

Premising that there is no external evidence to indicate what books Shakespeare read, with the doubtful exception of an autograph in Florio's translation of Montaigne, the reader gave many illustrations and reasons for thinking that Shakespeare was acquainted with the following books, amongst others:—

GREEK.

North's Plutarch; Chapman's Homer.

LATIN.

Golding's Ovid; Phaer's Virgil; Marlowe's "Pharsalia;" Holland's Pliny; Plautus; Seneca.

FRENCH.

Florio's Montaigne; Belleforest.

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SPANISH.

Montemayor's "Diana."

ITALIAN.

Bandello; Cinthio; Boccaccio; "I Pecorone;" "Il Sacrificio;" Ariosto; Florio's Dictionary.

ENGLISH.

School Books:—Lily's Grammar; "Sententiæ Pueriles."

History:—Holinshed; Stow; Hall; Froissart.

Travel:—Eden; Hackluyt; Marco Polo; Linschoten.

Theology:—Harsnet's "Declaration of Popish Impostures."

Fiction:—Moore; Lyly; Lodge; Greene; Nash; Sidney; Paynter; "Barnaby Riche;" "Gargantua;" "Gesta Romanorum;" "Dr. Faustus;" "Historie of Hamblet;" "Westward for Smelts;" "Hundred Merry Tales;" "Humour of Forty Fancies;" "Pennyworth of Wit;" &c., &c.

Criticism:—Puttenham's "Arte of English Poesie;" Wilson's "Rhetorique;" Silvayn's "Orator."

Science:—Bacon.

Poetry (i.), Dramatic:—Old plays on "Henry V.," "King Leir," "King John," "Taming of a Shrew;" and, probably, "Comedy of Errors," "Richard III.," "Troilus and Cressida," "Hamlet," "Richard II.," "Antony and Cleopatra." "The Jew," Whetstone's "Promos and Cassandra," Middleton's "Witch," Lord Sterline, Kyd, Peele, Fletcher, Harrington, Preston, Marlowe, Jonson, &c., &c.

Poetry (ii.), not Dramatic:—Chaucer; Gower; Lydgate; Brooke; Spenser; Sidney; Daniel; Drayton; Whitney; Heywood; Tottell's "Miscellany;" "Paradise of Dainty Devices;" and more than fifty songs and ballads quoted or alluded to.

A discussion followed, in which Mr. A. H. PAGET, Mr. SIMPSON, Mr. DAWSON, Mr. HARVEY and the CHAIRMAN took part, and a hope was expressed that the paper would be published or re-delivered in another and more public place.

Mr. BILLSON intimated that the essay would shortly be published in a volume of Shakesperian studies by various writers.

Mr. ROBERT HARVEY then read a very interesting paper, entitled "An Old Reporter," consisting of a selection of cases from Sir Creswell Levinz, reports of cases determined in the King's Bench, *temp.* Charles II., illustrating various social and other phenomena of the time.

December 14th.—Mr. W. SIMPSON, Junr., read a most interesting paper on "Trial by Jury in Ancient Leicester."

Mr. A. H. PAGET followed with a valuable paper, entitled "The Opening of some of Shakespeare's Tragedies," illustrating his remarks by readings from "Macbeth," "Romeo and Juliet," "Richard III.," "Hamlet" and "Othello," and pointing out that in each of these plays the key-note of the play is struck in the opening scene.

W. JACKSON, *Chairman.*

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SECTION "B."

FOR ASTRONOMY, PHYSICS, AND CHEMISTRY.

This Section has not met during the past quarter.

E. ATKINS, *Chairman.*

SECTION "C."

FOR GEOLOGY.

The usual monthly meeting of this Section was held on Thursday, the 14th of October, when Dr. C. A. Moore read a paper on "The Connection between the Geology and the Health of a District." The paper was followed by an interesting discussion, and a reference to several local illustrations of the principles Dr. Moore had laid down.

It was decided that no meeting of the Section should be called in November.

At the meeting on the 9th of December the Chairman read a paper on "The Mineral Spring at Shearsby." It was thought that the subject would repay further examination, and it was arranged that it should again be brought before the Section.

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

The Section did not meet in the month of August.

September 15th.—Dr. COOPER exhibited a specimen of *Spiræa salicifolia* from North Wales, apparently wild.

The Rev. T. A. PRESTON, M.A., exhibited a fine series of Glass Models, by Blaschka, of Dresden, representing the life-history of an *Obelia*, showing the natural size of the polypidom, the same greatly magnified, with the polyps in the cells, and the free Medusæ, in two stages. It was stated that these glass models could now only be got through Mr. Damon, of Plymouth.

Mr. E. F. COOPER, F.L.S., distributed dried specimens of some of the rarer Leicestershire plants from Saltby, including *Helianthemum vulgare*, *Asperula cynanchica*, and *Calamintha Acinos*.

The CHAIRMAN exhibited a metacarpal bone of *Bos longifrons*, the smallest of the old races of European cattle, taken from the floor of the butcher's shop, in the ancient Roman town of Uriconium, in Shropshire.

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The CHAIRMAN read a short paper on "Rats, and the occurrence of the Black Rat in Leicestershire," exhibiting a specimen of the black rat recently captured at a farm, about a mile from Leicester.

The CHAIRMAN suggested that it would be useful and interesting work for the members of the Section to practice the art of setting up life-groups of invertebrate animals, showing the history and habits of the species. These being small and easily preserved, groups could be set up pictorially, without the apparatus of a special workshop.

October 20th.—Mr. W. A. VICE exhibited a number of fresh fungi, including some small specimens of the remarkable agaric, *Schizophyllum commune.*

Mr. E. F. COOPER, F.L.S., exhibited pieces of dead sticks, thickly covered with the beautiful pink fungus, *Tubercularia vulgaris.*

Miss GRUNDY exhibited a pencil sketch of a beech tree, with several boughs naturally inarched, and grown together.

Dr. FINCH exhibited a fine example of the pendent nest of a wasp, on a branch of Cedar of Lebanon, from the grounds of the Borough Lunatic Asylum. The nest was nearly globular, about five inches in diameter, and when taken was deserted, the gardener having seen the wasps fly away in a body, carrying something with them which appeared to be either eggs or larvæ.

The CHAIRMAN, in the absence of the Author, read a paper by Mr. H. E. Quilter, on "The Metamorphoses of *Galeruca nymphæa*, a coleopterous insect," describing the larvæ collected from the floating leaves of *Polygonum amphibium* and the phenomena of their changes into pupæ and perfect beetles, carefully watched and recorded by himself. The CHAIRMAN remarked that this paper was a useful contribution to a branch of entomology, in which there was still a wide field for amateur work.

November 17th.—Mr. J. H. GARNAR exhibited specimens of the small crustacean *Asellus aquaticus*, common at the bottom of ponds, and showed under the microscope the circulation of the internal fluid.

Mr. E. F. COOPER, F.L.S., exhibited several rare British plants, and stated that a white rat and a white-headed blackbird had been seen in a garden in Leicester.

Dr. FINCH exhibited a remarkable variety of the common foxglove.

The CHAIRMAN stated that Mr. G. A. VICE had sent him a specimen of *Tremella albida*, a fungus not previously recorded in the county. He had himself recently found, near Beaumont Leys, a large group of the handsome fungus, *Agaricus rachodes*, several of which he had had cooked and found them particularly excellent.

Dr. TOMKINS read a short paper on "The Cultivated Bacillus of Anthrax." He described the disease known as Anthrax, or woolsorter's disease, or splenic fever, which appeared among cattle, at Arnesby, in

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this county, some months ago, and was probably caused by their drinking from a stream polluted by the washing of foreign skins. Several men caught it from the cattle, and one died. Dr. TOMKINS had obtained matter from the pustules and found it swarming with the characteristic bacillus, mixed with a common micrococcus. He had cultivated the two together in nutritive gelatine, and found that in these conditions the micrococcus gradually overpowered, and finally extirpated, the bacillus.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

October 18th.—Mr. F. R. ROWLEY read a paper on "The Structure of Insects."

The paper was devoted to a consideration of the principal points in insect anatomy; the forms and microscopical structure of the muscles, nerves, &c., and the arrangements and functions of the various organs in the respiratory, circulatory, and digestive systems. Many interesting points in insect life history were touched upon, and at the conclusion of the paper, those members of the Section interested in Entomology were urged not to rest content with merely acquiring a knowledge of the outward forms and appendages of the insects collected by them, but to devote some time to the study of their internal structure, as, apart from the essentially interesting character of the pursuit itself, many points yet remained to be elucidated, in the working out of which painstaking observations would prove of great value.

Mr. G. H. STORER gave some notes on the habits of the *Syngnathidæ*, or pipe fishes, calling attention to the curious abdominal pouch of the male in *S. acus*, and the hemispherical cells in *S. anguineus*, into which the immature ova, when deposited by the female, are placed, and protected until the young fry are hatched, to which, for some time after they acquire the use of their fins, the pouch affords a place of refuge. The habits of Hippocampus brevirostris in captivity were described. Mr. STORER exhibited *S. acus* and *S. anguineus*, from Hastings, also two species of *Hippocampi*. Mr. ROWLEY, a specimen of *H. brevirostris*; and Mr. W. A. VICE, specimens of *S. anguineus*, from Torquay.

November 1st.—Mr. STORER read an interesting account of some birds observed at Virginia, County Cavan, exhibiting a considerable number of stuffed specimens and skins, amongst which were Kestrel, Teal, Wild Duck and several young, common Sandpiper and eggs, Curlew with young, Coot and eggs, Landrail, Reed-bunting, Goldfinch, &c.

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It was noted that in several instances the specimen was more highly coloured than ordinary English examples. Mr. STORER recorded the occurrence of the Tree-pipit, near Evington, April 26th of this year when he shot two specimens.

The CHAIRMAN brought forward an instance of heredity, shown in the case of a woman who had the third and fourth fingers of the right hand webbed, and six toes upon the left foot, the three outer also webbed. Her mother had the same mal-formation of the foot; and the peculiarity of the hand appeared in the mother's brother's son, of whom two daughters had the fingers webbed; showing how the deformity passed over the males of the family to appear in the females.

December 13th.—Mr. QUILTER made a communication upon "The Mollusca of the County," recording 13 additions to his list, three being slugs; amongst the shells was a species of rare Land Shell, Vertigo, specimens of which he had found in the subsoil, at Crown Hill, near Evington.

Mr. QUILTER had also received a communication from Mr. INGRAM, which led him to believe that the *Testacella* occurred numerously about Belvoir. Mr. ROWLEY exhibited several interesting slides, one especially so, of the peculiar hairs of *Ornithorynchus*.

F. M. POPE, *Chairman.*

Announcements.

GENERAL MEETINGS.

1887.
Jan. 10.—Lecture. Dr. A. C. POPE, M.R.C.S. "Hahnemann: his Life and Work."
,, 24.—Lecture. Sir JOHN LUBBOCK, Bart, M.P. "Savages: their Ways, Customs, and Ideas." *(This Lecture will be given in the Temperance Hall.)*
Feb. 7.—Readings. Arranged for by the PRESIDENT. "Old English Songs and Sonnets."
,, 21.—Lecture. Rev. STOPFORD A. BROOKE, M.A. "Shelley."
Mar. 7.—Lecture. Dr. H. W. CROSSKEY, F.G.S. "The Physical History of Great Britain from the Glacial Epoch."
,, 21.—Lecture. JUSTIN MCCARTHY, Esq., M.P. "The House of Commons: a Picture of its Ways and Principal Figures."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. W. JACKSON, Loseby Lane, Leicester.
Secretary—Mr. J. SCAMPTON, 1, Pelham Street, Leicester.

1887. *List of Papers to be read.*
Tuesday, Feb. 8.—Mr. J. D. PAUL, F.G.S. "Lourdes and Leicester."
,, Mar. 8.—Mr. THOS. CARTER, LL.B. "Local names."

W. JACKSON, *Chairman.*

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SECTION "B."

Chairman—Rev. E. ATKINS, B.Sc., The Fosse.

Secretary—W. S. FRANKS, F.R.A.S., 1, High Street.

Meetings will be held during the present Session upon the undermentioned dates:—
1887—January 20th, February 17th, March 17th.

The meetings are held in the Laboratory at the Wyggeston Boys' School, High Cross Street, at 7.30 p.m.

E. ATKINS, *Chairman.*

SECTION "C."

Chairman—J. D. PAUL, F.G S., 118, Regent Road.

Secretary—A. F. ATKINS, 165, London Road.

This Section meets in the Council Room of the Society, at the Museum, on the second Thursday in each month, at 7.30 p.m.

J. D. PAUL, *Chairman.*

SECTION "D."

Chairman—F. T. MOTT, F.R.G.S, Birstal Hill, near Leicester.

Hon. Secretary—Dr. COOPER, King Street, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

FIELD DAYS—The second Wednesday afternoon in each summer month.

EVENING MEETINGS.

January 19.—Exhibition of Specimens. Subject for discussion—The Relations between Deciduous and Evergreen Plants. Paper by Rev. T. A. PRESTON, M.A., on "The Observation and Recording of Phenological Phenomena."

February 16.—Exhibition of Specimens. Practice with dissecting microscopes. Subject for discussion—The biological meaning and action of a "Stimulant."

March 16.—Exhibition of Specimens. Subject for discussion—The Relations between Univalve and Bivalve Shells. Paper by the CHAIRMAN on "The Voices of Animals."

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—F. M. POPE, M.B., Campbell House, London Road.

Secretary—W. A. VICE, M.B., 5, Belvoir Street.

The meetings of the Section will be held on the under-mentioned dates, in the Council Room, Town Museum, at 7.30 p.m. Members are desired to bring specimens for exhibition to all the meetings. The appended papers have been promised.

January 17.—Mr. F. R. ROWLEY will exhibit specimens.
February 14.—Mr. G. H. STORER, "The Starling and its Allies," with Specimens.
March 14.—F. M. POPE, M.B., on "Muscle."

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART III., APRIL, 1887.

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Officers of the Society and of the Sections.

Session 1886-87.

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B. ASTRONOMY, PHYSICS, AND CHEMISTRY,
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C. GEOLOGY,
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D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, F. T. MOTT, F.R.G.S.
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E. ZOOLOGY.
Chairman, F. M. POPE, M.B.
Secretary, W. A. VICE, M.B.

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Session 1886-87.

JANUARY—APRIL, 1887.

GENERAL MEETINGS.

January 10th, 1887.—Dr. A. C. POPE, M.R.C.S., on "Hahnemann: His Life and Work."

January 24th, 1887.—Sir JOHN LUBBOCK, Bart., M.P., on "Savages: their Ways, Customs, and Ideas." (This Lecture was given in the Temperance Hall.)

February 7th, 1887.—Readings, arranged by The PRESIDENT. "Old English Songs and Sonnets."

After some introductory remarks by the PRESIDENT, Mr. STRINGER BATE gave the first readings, consisting of specimens of old English ballads.

Mr W. SIMPSON, Junr., then read a short paper, illustrated by readings, on old English love songs.

Mr. A. H. PAGET read a paper on old songs quoted by Shakespeare, and read some of the longer specimens.

Mr. F. T. MOTT read a short paper on old English sonnets, and quoted many examples.

The programme was then closed by the President, who read a few songs.

February 21st, 1887.—The PRESIDENT on "'Songs of Innocence.' and 'Songs of Experience,' by William Blake, Poet, Seer, Man."

In the absence of the Rev. STOPFORD A. BROOKE, M.A., who had promised to lecture on "Shelley," but was prevented by illness from coming to Leicester, the President gave an interesting address on the life and poetry of William Blake, and read many of his songs.

March 7th, 1887.—Dr. H. W. Crosskey, F.G.S., on "The Physical History of Great Britain from the Glacial Epoch."

The LECTURER commenced with a sketch of the condition of Great Britain at the time when it stood at a higher level than at present, and was thus joined to Continental Countries. He then showed how the ice, which then covered the land, conformed itself to the shape of the

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country; and pointed out the effects produced by the ice sliding down. He next pictured Great Britain gradually sinking until it reached 600 feet, and possibly 1600 feet beneath the sea. During this period the ice broke off, and in the form of icebergs carried rocks from one part of the country and deposited them in another. Then followed an elevation to a somewhat higher level than the present, together with a slight warmth of climate—sufficient at any rate to enable great forests to develop themselves over the country in the north. The LECTURER concluded his address with an eloquent peroration on the majesty of the Universe.

March 21st, 1887.—JUSTIN MCCARTHY, Esq., M.P., on "The House of Commons: a picture of its Ways, and Principal Figures." (Professional.)

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SHEARSBY—THE CHELTENHAM OF LEICESTERSHIRE.

By J. D. Paul, F.G.S. (Read before Section "B.")

The answer to the question, what are springs and how do they arise, is very well known to you all. Water in the form of rain falling upon porous ground sinks beneath the surface, gradually saturates the soil, and passes through and along this porous strata till it is stopped by an impervious bed, above which it collects and forms an underground reservoir of water. When we sink a well into this saturated ground and the water flows in, we speak of having reached a spring; if the impervious floor, which we have referred to as arresting the further descent of the water, crops out on the side of a hill, and the water collected above it flows out, we have another form of spring. We have many instances in the neighbourhood of such springs. On the eastern side of the County, the bottom of the Marlstone Sands lying upon the impervious Lower Lias Clays is marked by a line of springs which are the heads of the Whissendine, the Billesdon, and other large brooks. There is no doubt that these underground waters frequently descend to great depths before they reappear as springs. We may imagine water falling upon an upland, then passing along the descending slope of a porous strata and returning to the surface, through some fault or crevice in the ground. This underground water travels sometimes through miles of underground strata, and as it does so, it dissolves, as might be expected, the different soluble matters which it meets in its course. We call any water in which this soluble matter is of unusual amount or importance, a mineral water. The substances most frequently found dissolved in these mineral waters are the salts of soda, lime, magnesia, iron, the compounds of sulphur, and small quantities of iodine and bromine.

We have still another peculiarity to note in these mineral springs. Many of them as they issue from the ground have the temperature of ordinary spring water, about 52 degrees, but others are very much hotter. We have only two such springs in England; at Bath, where the temperature of the water is 120 degrees, and at Buxton where one of the springs reaches 82 degrees. If we seek for the source of this heat we need only call to mind that as we penetrate beneath the surface of the earth the temperature increases at the rate of about one degreee for every 50 feet we descend, so that at about 6000 feet, if this increase regularly continues, we should find the strata as hot as the hottest springs. We know that in many parts of the globe we need not penetrate to this depth to reach such a temperature. In the neighbourhood of the hot

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springs and terraces in New Zealand, the scene of the recent volcanic outburst, the surface attained a very high temperature. As a rule these hot springs are found in districts subject to volcanic influences, or near to mountain chains which have been comparatively recently elevated.

So far as to springs generally. Let us now turn our attention to the mineral spring at Shearsby. Throsby, who published his history of Leicestershire in 1790, and seems to have visited the place, makes no mention of the spring. But Nichols states "in this lordship is a famous spring, situate not a hundred yards from the public road from Shearsby to Bruntingthorpe, about half a mile from Shearsby. It is an uncovered round pit at which no cattle will drink. It is about ten or twelve yards in circumference, and in August, 1805, was about a yard and a half deep, being then full. Its taste is very saline and brackish, without any acidity; and in very dry seasons is probably more salt than it was after the last wet summer. The son of an inhabitant of Shearsby sometime since drank the water and bathed in it for a scorbutic complaint, and found great benefit from it." Since then the pond has been filled up, the site laid out as a garden, a well has been sunk, suitable baths constructed, and very comfortable accommodation provided for bathers. The following analysis of the water was made some years since by Mr. R. Hayton Davis:—Specific gravity 1004·69. Saline constituents in an imperial gallon, in grains.

Carbonate of Iron	traces.
Carbonate of Lime	9·743 grains.
Carbonate of Magnesia	6·246 ,,
Carbonate of Soda	5·581 ,,
Sulphate of Soda	128·989 ,,
Chloride of Sodium	245·532 ,,
Chloride of Potassium	traces.
Hydrosulphide of Sodium	·275 ,,
Iodine and Bronime combined	traces.
Total ...	396·366 grains.

How can we explain the presence of these ingredients in the water of this spring, in accordance with the account we have given of the origin and action of Springs?

The Shearsby spring rises through the Lower Lias Clays, which form the bottom members of a series stretching in a band, here about 20 miles wide, from the Bristol Channel to the mouth of the Tees. Starting from the spring, if we walk towards the west, we must pass over these beds for about five miles before we come upon the Keuper marls and sandstones lying next beneath them, and if we continue our journey we should find these Keuper beds forming the surface of the country twelve miles up to the foot of the Hartshill Range. The whole of these beds have a general dip or slope to the south-east, which would probably give a thickness of about 700 feet to the Lower Lias at Shearsby. It will be seen from this that rain falling upon the porous sandstones which come to the surface along the high ground of the Hartshill and elsewhere,

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would readily pass down along the sloping beds of the Keuper till it encountered some fault or crevice, through which it could rise to the surface, and form the spring at Shearsby. If the water which rises to the surface at Shearsby, has made a long underground journey through the sandstones and marls of the Keuper, we may reasonably expect that it would take up in solution some of the soluble minerals which it would meet with on its passage. When we recall the conditions under which these Keuper beds were deposited, we have no difficulty in foretelling what these soluble matters are likely to be. The red marls and sandstones were deposited in shallow seas, or lagoons, to which the sea had occasional access, and the evaporation of the sea water would throw down first the salt and then the gypsum, which we find so plentifully in the upper beds. A comparison between the analysis of sea water and that from Shearsby spring, will show that, with one exception, the sulphate of soda, every ingredient we find in the spring is contained in sea water. The best explanation of the presence of the sulphate of soda is suggested by a reference to what is now taking place in Patagonia and the country, lying to the east of the Caspian Sea, where conditions now prevail very closely resembling those which existed in our own country when these Keuper beds were being laid down. In both these countries the surface has but recently risen above the level of the sea, and at such times as the last shallow seas were evaporated from its surface, it was covered with crystals and other substances contained in sea water. Darwin found when he visited Patagonia,* and O'Donovan frequently notices the same fact in his travels in Turkestan, that the ground was covered with crystals of sulphate of soda and common salt, which in dry weather looked as if the ground were covered with snow. The strip of land a few miles wide on the Atlantic coast of Patagonia, which had last risen above the sea level, was covered with chloride of sodium, whilst the sulphate of soda increased with the distance from the shore, where vegetation had existed for a longer time. Darwin remarks "this circumstance would tempt me to believe that the sulphate of soda is generated in the soil, from the chloride left on the surface during the slow and recent elevation of this dry country. Have the succulent, salt loving plants, which are well-known to contain much soda, the power of decomposing the chloride? Does the black fetid mud, abounding with organic matter, yield the sulphur and ultimately the sulphuric acid?"

He elsewhere refers to the remarkable similarity between the salt lakes in Siberia and Patagonia. Siberia, like Patagonia, appears to have been recently elevated above the sea level. In both countries the salt lakes occupy shallow depressions in the plains, and the mud on their borders, beneath a crust of common salt, contains sulphates of soda, magnesia, and lime. We have only to suppose such a country as Darwin describes to be covered up first by wind-borne dust, and afterwards to sink beneath the ocean, where it would form the floor of a liassic sea and be overlain

* Naturalist's Voyage round the World, pp. 67, 78.

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by marine deposits, then water passing through such beds would take up in solution just the ingredients we find in the Shearsby spring. There can be but little doubt that the piercing of the upper beds of the Keuper anywhere along the band we have spoken of as stretching from Gloucester to the Tees, would very probably yield a water containing the same substances. A reference to the table at the end of this paper will show how much the spring at Shearsby has in common with those at Cheltenham and Leamington, whilst borings at Rugby and Hinckley have yielded a water of the same character. The well-known medicinal springs at Rehme, in Westphalia, and Friederichshall, in Saxe Meiningen, belong to the same class, and also rise through the Keuper beds.

Dr. J. Burney Yeo states* that the effect of these saline waters when used externally as baths, is to stimulate the external vessels, the nerves, and the capillary circulation, and indirectly to promote tissue change. Taken internally, they act as tonics to the organs of assimilation and digestion, increase the secretions of the alimentary canal, and promote its muscular activity, and improve the abdominal and general circulation.

* Nineteenth Century.—August, 1886.

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Saline constituents in the Imperial Gallon, in grains.	1	2	3	4	5	6	7	8	9
				Cheltenham.			Germany.		
	Half-ebb Water, River Mersey, Liverpool.	Shearsby Spring.	Hinckley Boring.	Old Royal Well.	Pittville.	Leamington, Bath Street Well.	Friederichshall, Saxe Meiningen.	Kissingen, Bavaria. The Soolensprudd.	Rehme, Westphalia. Soole Spring.
Chloride of Sodium	1295·50	245·532	71·2	590·33	481·19	476·96	546·	977·9	245·
,, Magnesium	85·60	...	...	8·	...	115·44	289·8	222·6	140·
,, Potassium	5·32	traces.	traces.	...	...	. .	...	...	...
,, Calcium	...	...	...	...	...	78·	...	...	70·
Sulphate of Soda	...	128·989	238·3	94·94	115·82	68·72	511·	227·5	525·
,, Magnesia	113·14	...	8·	...	...	...	287·7	...	175·
,, Lime	56·44	...	114·4	...	...	190·	7·	...	...
Carbonate of Soda	...	5·581	...	...	20·15	...	50·4	...	...
,, Magnesia	·80	6·246	22·3	6·80	11·39	...	...	58·8	35·
,, Lime	·64	9·743	...	17·06	7·70	...	18·2	...	210·
Iodine and Bromine	traces.	traces.	...	3·50	3·29	trace.	1·4	...	...
Silica	·64	...	1·4	2·75	2·77	trace.	35·5	...	...
Organic and Extractive Matter	...	...	...	18·39	3·85	...	2·8	...	...
Hydrosulphide of Soda	...	·275	...	...	...	...	...	...	...
Iron	...	...	...	...	...	...	...	2·8	...
Total Solids	1558·08	396·366	455·6	741·77	646·16	929·12	1749·8	1489·6	1400·

No. 2—R. Hayton Davis. 3—A. Bostock Hill. The remaining columns are from Professor Prestwich's paper on the Artesian Well at S. Clement's, Oxford, read before the Ashmolean Society, June 12th, 1876.

10.—With alumina and some alkaline carbonates.

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THE WILD GERANIUMS OF LEICESTERSHIRE.

By F. T. Mott, F.R.G.S. (Read before Section "D," *Sept. 16, 1885.*)

The popular Geraniums of the garden and green-house properly belong to the genus *Pelargonium*, having the flowers in umbels, the corolla irregular, three petals being of a different form from the other two, and one sepal furnished with an internal spur, which is united to the flower stalk, and is not always distinguishable on the outside.

The true Geraniums have both corolla and calyx quite regular, all the parts being equal and similar. The flowers are not in umbels, but either single or in pairs; the stamens ten, of which five ripen earlier than the others; the stigmas five, at the point of a long beak, and the carpels five also, each with an elastic awn which throws out the seeds when ripe.

From the genus *Erodium* it is distinguished chiefly by the mode in which the elastic awns do their work. In *Geraniums* they spring outwards with a single curve. In *Erodiums* they coil up suddenly into a spiral.

The names of these three closely allied genera are derived from the three Greek words πελαργος—a stork, γερανος—a crane, and ερωδιος—a heron. In all of them the fruit has a long beak shaped like the very similar beaks of the stork, crane, or heron.

Of the true Geraniums there are about 100 known species, distributed over all the temperate regions of the world. Twelve of them are found wild, or naturalized, in Britain, and of these twelve eight are recorded as belonging to the Flora of Leicestershire.

Of the twelve British species five are perennials, and seven annuals. We have three of the perennials and five of the annuals. They may be tabulated thus:—

BRITISH PERENNIAL SPECIES.

G. sanguineum	
G. sylvaticum	
G. pratense	Leicestershire
G. perenne (pyrenaicum)	do.
G. phœum	do.

BRITISH ANNUAL SPECIES.

G. molle	Leicestershire
G. rotundifolium	
G. pusillum	do.
G. columbinum	
G. dissectum	do.
G. Robertianum	do.
G. lucidum	do.

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Of the British species not found in this county, *sanguineum* is a plant chiefly of dry limestone rocks; *sylvaticum* is a northern form rarely occurring south of the Humber; *rotundifolium* is nearly confined to the southern counties, and *columbinum* to chalky districts.

Of our eight species, *phæum*, the dusky Cranesbill, or "mourning widow," as it is sometimes called in gardens, from its sombre colour, is not indigenous in Britain at all, and in the only two localities recorded in this county, viz.: the Spinney Hill plantations and the ruins at Kirby Muxloe, it is almost certainly a relic of cultivation. *Perenne*, or *pyrenaicum*, is also with us of doubtful nativity. It was pretty plentiful in a grassy corner by Belgrave mill two or three years ago—a locality which has, I believe, been destroyed by the new flood works; but the neighbourhood of a corn mill is often rich in plants imported from other districts with the corn. It is also reported from Thurnby and from Belvoir, both situations in which it might easily have escaped from some garden; but it is hardy and soon becomes naturalized, and may now be reckoned as a Leicestershire plant. The remaining six, viz: *pratense*, *molle*, *pusillum*, *dissectum*, *Robertianum* and *lucidum*, are all common throughout England, and certainly belong to the original indigenous flora of this county.

Geranium pratense, the Blue Meadow Cranesbill, is one of our handsomest summer flowers, though unfortunately the petals soon drop when the flowers are gathered. It is not very common, yet you can scarcely take a walk through the meadows in July without seeing it somewhere. There is no other plant in this county with which it could possibly be confused; but in Scotland, in the early summer, before there is any mature fruit, it is not always easy to distinguish it from *sylvaticum*. The deep blue colour of the flower will generally distinguish it, but not always, for the colour varies on different soils; and though the bending down of the flower-stalks, after flowering, is given as a special character of *pratense*, I have specimens of both *pratense* and *sylvaticum* in which this bending is scarcely more marked in one than in the other. In the fully formed fruit, however, it is more distinct, as in *sylvaticum* the pedicels recover their erect position, while in *pratense* they generally remain deflexed.

The two species, *molle* and *pusillum*, are a good deal alike, and liable to be mistaken by inexperienced botanists. The more deeply cut leaf of *pusillum*, with the narrow lobes distinctly separated, is a sufficient guide when the two have once been carefully compared; but the most marked difference is found in the carpels. *Molle* has these wrinkled and glabrous, while *pusillum* has them smooth and downy.

The three remaining forms, *dissectum*, *Robertianum* and *lucidum*, are unmistakeable. "Herb Robert" is an inhabitant of every hedge and ditch and copse and woodland throughout the county. Its pretty rosy flowers, purple stems, and strong scent, make it conspicuous, and it is curious that it should not have received a number of local English names; but it has been known as Herb Robert for several centuries, and I have

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not been able to find that it has any other name in English, except that it is sometimes known as "Stinking Bob" in the Midlands, and "Redshanks" in the Northern Counties.

G. dissectum, called the Great Dove's-foot, from the resemblance of its palmate leaves to the foot of a pigeon, is common by road sides and in waste places. Leo Grindon called it the Bashful Cranesbill, because its bright rose-coloured flowers seem to hide themselves among the foliage. It is a large straggling plant, sometimes making a clump two feet in diameter.

G. lucidum, the Shining Cranesbill, is the rarest of our six true natives. It delights in stony places, walls, and ruins, but is found also in hedge bottoms here and there about the county. The granitic district of Quorn and Mountsorrel seems to suit it best. It occurs there in several localities, but it has also long been one of the ornaments of the Ulverscroft ruins, on the Forest. It is a particularly pretty and conspicuous plant, having bright red stems and glossy foliage.

All our Leicestershire Geraniums are exclusively plants of the old world, and chiefly of Europe, except *dissectum*, which is also found in North America. The fragrant odour which most of them yield more or less, arises from a volatile oil secreted by the glandular hairs on the stems and leaves. There is tannin in *pusillum*, so that a decoction of it is used as an astringent. A yellow dye may be got from Herb Robert, and a blue one from the flowers of *molle*.

Beyond these slight uses, they have but little value to man, except as ornaments of the fields and hedges; though this is perhaps a much more important value than man, in this early period of his history, is able to appreciate.

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THE METAMORPHOSES OF GALERUCA NYMPHEA LIN.

By H. E. Quilter. (Read before Section "D," *Oct. 20, 1886.*)

While out by the side of Groby Pool, one Saturday afternoon, early in July 1886, I noticed and admired the show of *Polygonum amphibium L.* which was then in bloom. I was thinking over the modifications the plant must have undergone to adapt itself to being amphibious, as, at the same time the year before, owing to the drought, the water had gone down, and the plant was flowering on a dry beach.

My attention, however, was soon attracted by the fact, that upon the upper surface of the long floating leaves—so characteristic of this plant—were numerous insect larvæ. An examination soon convinced me that they were the larvæ of a coleopterous insect or beetle. Noting also that they were preparing to pupate, or turn into pupæ, I took home a quantity upon the leaves. They were generally clustered together upon the upper surface of the floating leaves, but some had crawled up the stalks of grass growing out of the water. Placing them in a box with a glass lid, I had the pleasure of watching the insect through the later stages of its metamorphosis. Owing to the difficulty, generally, of observing the changes undergone by beetles, the observation of them, even in the commoner species, is of interest; but when the beetle is uncommon as in this instance, the interest and utility is augmented.

The earlier stages of this beetle are as yet, so far as I am aware, unknown; when and where the parent insect deposits its eggs, so that the larvæ, upon leaving the egg, can feed upon an aquatic plant, is somewhat puzzling, especially when we recollect that the insect is not an inhabitant of the water. I may perhaps be allowed to suggest here, that from what I saw of the habits of the perfect insect, the parent deposits its eggs at the roots of the plant upon which the larvæ subsequently feed,—which are generally left dry or partially so about this time of the year—and that the larvæ are consequently aquatic, coming up out of the water, as already noted, to pupate upon the leaves and stalks of aquatic plants. I have before mentioned, that when the larvæ were found they were preparing to pupate. They were not eating and were motionless.

The larva is about $\frac{5}{16}$ of an inch in length, and has the usual number of segments—thirteen; the three segments near the head bearing two legs each. Underneath it is of a yellow colour, the upper surface of the segments being black with the yellow body shewing between, they appear to be again divided, but the division ends at the side in a

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roundish-prominence, from which spring two or three hairs. The whole body of the larva is covered with hairs. The cephalic segment is very small, and bears rudimentary antennæ and palpi, composed of three joints each, the apical joint being pointed. The caudal segment is also very much smaller.

After remaining motionless for a time, usually two or three days, the skin begins to split along the upper side of the larva, commencing with the cephalic segments. When this has properly commenced the insect seems restless, and moves upwards and downwards. This movement seems to act upon the skin and splits it farther, until the opening extends the whole length of the insect. This usually took about half-an-hour, and was done in the early morning. The skin is not entirely drawn or slipped off but is still fastened to the hinder segments, and serves to hold the pupa very securely to the leaf to which the skin itself adheres. This is a wise provision, as otherwise the helpless pupa might be washed off into the water, and drowned. The pupa, which the cast-off skin discloses, is of a golden-yellow colour, but in about five hours turns quite black.

The pupa is quiescent, and the parts of the perfect insect are very plainly seen. The head is applied against the breast, the antennæ lie along the sides of the thorax, the first two pairs of legs are entirely exposed, the other pair being covered by the elytra. After remaining in this quiescent state for seven days, the perfect insect emerged. The pupa skin commenced to split up along the back, as in the larva, and was drawn off in a similar manner, revealing the beetle or perfect insect. Not until the insect has partly emerged does it make any sign of movement; when the antennæ are fully exposed it begins to move them upwards, slowly, and by degrees, until they are in their proper position, then the first and second pairs of legs are used to push off, as it were, the enveloping skin, and the perfect insect is fully emerged. It is then of a golden-yellow colour, the antennæ and legs being of a darker colour, as also the elytra which do not appear to alter.

When first emerged the insect walked about for a short time, and then generally crawled under the leaves, until it had assumed its normal colouring and was fully able to fly, which happened in from two to three hours. At this time the body was quite black, and the legs and antennæ nearly of the same colour. The beetles ate the dead leaves in the box, and were rather lively, seeming to be gregarious, congregating together under the leaves.

After keeping them for some time, an unfortunate accident, during my absence, deprived me of the pleasure of watching their habits further.

The life of an insect, as we have seen in the later metamorphoses of a beetle, is one continued series of changes. These are not merely from the larva to the pupa, and from the pupa to the perfect insect,—during which it acquires new organs—but consist also of repeated sheddings of the skin, which occur at intervals, before the larva has attained its full size. It was at this period that I found the larvæ described.

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The question may naturally be asked, why does the insect undergo these metamorphoses or changes? The answer will come appropriately from the "Origin of Species," where the author says:—"The embryonic state of each species, reproduces more or less completely the form and structure of its less modified progenitors," and Herbert Spencer says:—"Each organism exhibits within a short space of time, a series of changes, which when supposed to occupy a period indefinitely great, and to go on in various ways, instead of one way, gives us a tolerably clear conception of organic evolution in general."

The present developmental history of a beetle really represents therefore the modifications which the species has undergone in past time, and as Sir J. Lubbock says:—"That the ancestors of beetles, under the influence of varying external conditions, and in the lapse of geologica ages, should have undergone changes, which the individual beetle passes through under our own eyes, and in the space of a few days, is surely no extravagant hypothesis."

It may be asked, whether, in looking over the records of the past history of the earth, we find anything by which the evolution of a beetle from other forms of life can be inferred; and here it must be confessed that Palæontology does not furnish us with any direct evidence with regard to the evolution of beetles. We must remember, however, that the crust of the earth, within which is written its ancient history, must be looked upon as poorly written, and with whole pages lost; so that we are left to look to Embryology for light upon the subject; and it is generally admitted that the structure of the embryo and its developmental changes—either within or without the egg—indicate as truly the course of organic development in ancient times, as the rocks and their sequence teach us the past history of the earth itself.

APPENDIX.

In a MS Catalogue of the Coleoptera of Leicestershire, by Fred. Bates, Esq., Leicester, April, 1854, I find the following:—

Galeruca nymphea. Linn:

On aquatic herbage, borders of Groby Pool. Rare. July.

September 11th, 1886.—I found larvæ, pupa, and perfect insects of *G. nymphea*, on Polygonum amphibium, at Saddington Reservoir.

The larvæ of Galerucidæ are sluggish, rather elongate, wrinkled, and with lateral tubercles, and an anal projection, serving as an extra leg. They live in company, and commit great ravages, often stripping every leaf off the trees, &c., on which they feed.

British Beetles.—E. C. Rye.

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The larvæ of *Galerucatanaceti*, which devour the extremities of grass, are somewhat lanceolate, composed of about twelve segments, spined and brown, with six pectoral feet. Pupa ochreous.

Farm Insects.—J. Curtis, F.L.S. 1859.

The larvæ of *Galeruca marginella*—found in *Myrica gale*, during the middle of August in Northern Maine—is shining black, coriaceous above, and the body is elongated, flattened, with a small orbicular black head. The upper side of the body is hard, from the close proximity of the black flattened tubercles. Beneath, whitish; on the side is a row of black tubercles, and along the middle of the body is a row of transversely linear brown tubercles, on each side of which is a minute dot-like tubercle. It is not hairy, and measures ·25 of an inch in length. When about to transform it fastens itself by its tail to the surface of a leaf. The pupa is brown-black.

Guide to Study of Insects.—A. S. Packard, New York. 1883.

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THE PHARYNGEAL TEETH OF THE CHUB AND ROACH.

By W. A. Vice, M.B. (Read before Section "E.")

In this paper I shall occupy some considerable space in order to examine into the development of teeth generally, and the structures of which they are composed. An ordinary mammalian tooth is composed of five different tissues, the pulp which is contained in a central cavity; dentine or tooth bone which forms the bulk of the tooth; the enamel covering the crown, the exposed portion of the tooth; and the cementum which is a thin layer intimately connected with the dentine forming the root and covered by the dental periosteum. It is through the pulp in the interior and the periosteum upon the root, that the tooth is nourished. In many teeth, more especially in the compound teeth of the ruminants, the cement covers the whole surface of the tooth, filling up the interstices between the folds of the enamel, and by its softness wearing much more rapidly than the enamel, causes the teeth to be maintained in a condition suitable for cutting or grinding.

Huxley states that the teeth of Mollusca and Annulosa are always cuticular or epithelial structures; but in Vertebrates true teeth are invariably developed from the layer beneath the epithelium of the mucous membrane corresponding with the dermis in the integument. The epithelium plays, however, an important part in the production of the teeth in the majority of animals.

In the mammalian jaws, at a very early stage, there is an increase of the epithelial cells along the position which will be occupied by the future teeth. Beneath this line of increased cell development, the epithelium becomes inflected into the subjacent tissue, and at each point where a tooth is to be formed, this folding of the epithelial layer throws out, as it were, processes, which by the increase of the epithelial cells, swell out, and assume the shape of Florence flasks; the growth continues; and the bulbous portion flattens out; and by the rapid growth of the edges ultimately assumes a bell shape, the mouth being toward the jaw, the handle of the bell represented by the thin process of epithelial tissue still connecting it with the surface membrane. While this has been proceeding a change has been taking place in the submucous tissue, and the dental germ has been formed immediately under the bell-shaped expansion of the epithelium, which is the enamel organ of the future tooth. The dental germ, somewhat similarly to the enamel organ, spreads out laterally and gradually, its edges overlap those of the enamel organ, and, ascending around it, at last completely enclose it; thus is formed the dental

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sac, in which the formation of the tooth proceeds. At the junction of the enamel organ and the dental germ, that is as it were the inside surface of the bell, the calcification of the tooth commences; in both structures cells are specially modified, enamel cells to form the enamel, and the odontoblasts, which produce the dentine.

The formation of enamel takes place within the enamel organ, the first layer of dentine and the first of enamel are conformable to each other, the enamel is formed from within outwards, the dentine from without inwards. No portion of dentine, once calcified, can receive any increase externally; all increase takes place at the expense of the interior germinal matter. While the dentine is being formed, the odontoblasts occupy the whole surface of the dental germ; hair-like processes project from their outer surface, and around these the dentine is deposited, the processes remaining as the dentinal fibrils, the solid calcified tissue around being the dentinal tubes. In teeth of limited growth the root is tapered off and completed; the cavity interiorly being occupied by the pulp, consisting of remains of germinal tissue with its blood vessels and nerves. In teeth, such as the gnawing teeth of Rodents and the tusks of elephants, which grow continuously, the dental pulp retains its original size or enlarges with the growth of the tusk.

The dentine, which has been spoken of and in which the dentinal tubes form one uniform compact tissue, is termed hard or non-vascular dentine. But in many animals there occur modifications of this, called frequently secondary dentine, varieties of which are known as vaso dentine and osteo dentine. Tomes writes, "in the teeth of many fishes the upper portion is found to be composed of dentinal tubes regular in disposition, radiating from the axial pulp chamber; lower down in the teeth the dentinal tubes become less numerous, and at the same time much larger, looped canals make their appearance, and as these become more numerous and regular so do the dentinal tubes become less so; these larger tubes contain blood vessels, and red blood circulates through them, a central pulp chamber remains."

Osteo dentine is a tissue more strongly marked off from hard dentine, more nearly approaching bone; it is not developed on the surface of the pulp but within its whole substance, consequently there is no single central chamber and simple pulp, but pulp and calcified tissue are interwoven together; the numerous large channels much less regular than in vaso dentine, contain not simple capillarytubes, but a mass of pulp tissue.

The attachment of teeth to the bones which carry them, may be either by means of fibrous membrane, by an elastic hinge, by auchylosis, or by implantation in a socket; at the same time it must be stated that these methods may be seen passing by gradational forms into one another.

Of the teeth of the "Teleostei," the osseous fishes, Huxley writes, "most Teleostei possess teeth, and in the majority of these fishes teeth are widely distributed over the surface of the oral and pharyngeal cavities. The teeth vary much in structure, ordinarily they consist of *dentine*, capped with structureless enamel. The teeth of the majority of

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these fishes are isolated, more or less pointed, ankylosed to the subjacent bone, not imbedded in alveoli. They are developed from papillæ of the mucous membrane, and are not inclosed in sacs." Again quoting from Huxley, I would refer briefly to the anatomy of the parts with which we are chiefly concerned in this paper. He writes, "in the Teleostei, there are usually five pair of branchial arches connected by median ventral ossifications. The posterior pair are single bones which underlie the floor of the pharynx, bear no branchial filaments, but commonly support teeth, and are called hypopharyngeal bones."

The teeth are ankylosed to these bones, and consist of nonvascular dentine in the upper portion, osteo dentine toward their base. They are hollow in the dry specimens, the cavities being filled with pulp tissue in the recent state. The numbers are not constant, some have the appearance of having been broken off and of having become attached again. If our ordinary belief is correct, that these fishes live on food requiring little grinding, this breakage can scarcely be possible; perhaps, as in many other instances, the teeth are thrown off and renewed; this appears to me must occur, for if the dentine be formed in the first instance of its permanent size, it is only by the renewal of the teeth that we can account for the much larger size in the larger fishes. The bone is evidently freely supplied with blood vessels, as may be deduced from the numerous foramena on the opposite surface of the bone to the teeth, and also about the bases of the teeth themselves. These teeth to some extent may grind against each other, but they much more readily grind against the specially adapted tubercle, developed on the basi-occipital bone. In the head which I have brought to show the position of these teeth in the throat, you will be able to see how the strong muscles attached to the surrounding parts, and especially to the spine of the occipital, will be capable of grinding the teeth against this tubercle.

The series of hypopharyngeal bones shown, well illustrates the points referred to; the increase in the size of the teeth according to the increased size of the fish may be readily perceived.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE AND ECONOMICS.

This Section has held two meetings during the quarter, with an average attendance of 10 members.

February 8th.—Mr. J. D. PAUL, F.G.S., read a paper entitled "Lourdes and Leicester."

The paper commenced with a description of the Castle of Lourdes, in the South of France. Placed on an isolated rock, rising up in the throat of one of the north and south parallel valleys in the Pyrenees, its natural strength made it an admirable site for a fortress. In the year 1248, Henry the Third of England appointed his brother-in-law, Simon de Montfort, Viceroy of Gascony, and in the execution of this office, in the six following years, Simon made five different expeditions, in which he trampled down serious insurrections of the Gascons. It was a necessary part of his policy to obtain possession of the strong places in the country, and amongst them he acquired, by treaty, the Castle of Lourdes. As long as he lived he remained Lord of the Castles, both of Lourdes and Leicester. Looking at his Lordship of the Castle of Lourdes as a part of the government of Gascony, which absorbed all his energy, and made him an absentee English Earl, and unquestionably impoverished him seriously, an attempt was made to trace out the influence which his viceroyship had possibly on the burgesses of Leicester, inducing him to grant them, for a money payment, charters, to forbid the residence of Jews in the borough, to substitute primogeniture for Borough English, to admit that the "brigge silver and govel pennies" had been unlawfully collected, and to exempt the burgesses from the duty of reaping his corn. The paper concluded with a sketch of life in Gascony, at a period somewhat later than the time of Simon de Montfort, taken from Froissart's account of his twelve weeks stay there at Orthès, in the household of Gaston Phœbus, Count de Foix.

March 8th.—Mr. THOS. CARTER, LL.B., read a most interesting paper on "Local Names."

This was a continuation of a former paper read before this Section (Trans. 1885-6, page 108), on Danish Place-Names. Its object was to show that besides the names that could be traced to a purely Danish or

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English (Anglo-Saxon) origin, there were many that were of a hybrid formation, containing Danish prefix with English suffix, and vice versa. This was owing to the position of Leicestershire on the western border of the Danelagh, and was evidence of that fusion of race that must have taken place between the two peoples, after the severity of their struggles was over.

Numerous examples were given, chiefly from the —thorpes and —tons of the County, with maps to illustrate their distribution.

The CHAIRMAN (Mr. JACKSON), Mr. J. D. PAUL, and Mr. SIMPSON, took part in the discussion that followed.

"Trial by Jury in Ancient Leicester." By W. SIMPSON, Junr.

After describing the growth of Trial by Jury in this country, and referring to the chief methods of trial anciently practised (trial by compurgation and trial by ordeal among the free Normans, and trial by battle introduced after the Norman Conquest), Mr. SIMPSON continued:—"Prior to the Norman Conquest the City of Leicester was governed by the 'Guild Merchant," a close body elected by only such portion of the inhabitants as were burgesses or freemen. This Guild Merchant was practically the Corporation. The civil and criminal business of the town was conducted in the 'Portmanmote,' or Townman Meeting, corresponding to the Court Leet. The Chief Officers of the Guild Merchant, and also of the Portmanmote, were 24 Jurors or Jurates, annually elected by the burgesses. These Jurors occupied much the same position on the Guild Merchant, as Aldermen do on our Town Council of to-day. They also sat at the Portmanmote in much the same way as Magistrates sit in our Police Courts. Over these Jurors presided the Bailiff, who at a later period was called Mayor."

Mr. SIMPSON, after pointing out the dissimilarity between these Jurats and the modern Jury, proceeded to consider the changes introduced by the Norman Conquest, and mentioned the circumstances under which the trial by Jurats was resumed in Leicester after the Conquest. In the "Great Charter" of Edmund Crouchback, he noticed that the germ of our modern Jury had already sprung up. "Let the Plaintiff come back to the chief Court, and by 12 lawful men prove in what that Court has failed of right to him." The jurisdiction of the old Jurats appears to have been superseded by that of Justices of the Peace and Magistrates in the 15th Century; and in the reign of Elizabeth the Guild Merchant became merged in the Corporation.

December 23rd, 1886.—"Notes on the Opening of some of Shakespeare's Tragedies." By A. H. PAGET.

A few instances were taken to show how skilfully the openings are often contrived. In some cases the agency that brings about the catastrophe is vividly displayed, as in Romeo and Juliet and Othello. In others the central idea of the drama is placed before us, as in Richard III,, Hamlet, and Macbeth.

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In Romeo and Juliet the fortunes of the lovers cannot be considered apart from the feud of the Capulets and Montagues; and, indeed, in the structural arrangement of the play, this feud is the leading theme to which the love story, though so fully developed, is secondary. Now Shakespeare makes us feel at the outset the atmosphere of contention in which we move. The opening of this tragedy is a grand *crescendo* passage, rising from homely jests and vulgar taunts, to passion and princely dignity. This brings home to us how stormy life was in Verona, and how bitter the environment of the lovers.

The motive power of Othello is Iago's envy of Cassio, whom the Moor has promoted over his head. For this Iago must have vengeance, and his purpose is declared in the opening speeches. Thus the first words shadow forth the issue of the tragedy.

Richard III. is remarkable among Shakespeare's works for the absolute devilry of the hero. He is a fancy artist in crime, and he has to the full an artist's joy in his work. Hypocrisy with him is a garment lightly worn; and his victims seem invited to relish its humour only less keenly than the spectators at the play. Richard is thus an exceptional creation, scarcely belonging to human kind. And it is in harmony with his special nature that he opens the play in his own person, declaring himself to be apart from good and about to revel in villany.

In Hamlet, it is most fitting that we should be thrilled by the actual presence of the Ghost before getting further into the story. We are at once brought face to face with the mystery that is the key-note of the drama. The physical darkness and chill of the opening scene, the sense of depression and fearful expectancy pervading it, prepare us for a tragedy filled with deep speculation, and in which the prevailing tone is melancholy.

Writing of Macbeth, Professor Dowden says that "the good and evil done in the world do not pass away, but remain as an impersonal force that may shape the character and lives of future generations." This tragedy tells of the accumulated forces of evil which constitute, this writer says, a zymotic poison of sin, to which natures, morally enfeebled, may succumb. The witches, who stand for this evil power, are first brought before us, since from them the action proceeds. The first words spoken by Macbeth show an affinity between his soul and the hags. The spectator's mind is thus prepared for Macbeth's rapid absorption into the vortex of sin.

Mr. W. JACKSON was re-elected Chairman of the Section for the next session. Mr. J. SCAMPTON re-elected Secretary.

W. JACKSON, *Chairman.*

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SECTION "B."

FOR ASTRONOMY, PHYSICS, AND CHEMISTRY.

The Section met on two occasions during the past quarter, viz: February 17th and March 24th, when the following papers were read:—

"Time and Gravitation."—E. ATKINS.

"Periodical Law in relation to the chemical elements."—W. BURFORD.

EDWARD ATKINS, *Chairman.*

SECTION "C."

FOR GEOLOGY.

March 10th.—Dr. C. A. MOORE was elected Chairman of the Section for the ensuing year. Mr. A. F. ATKINS was re-elected as Secretary.

Mr. H. E. QUILTER read a paper on "Belemnites and their modern representatives." The paper began by a description of the structure and classification of Belemnites. The question as to the descent of the Belemnites from a Nautiloid ancestor was then entered into, and Prof. Lankester's remarks were quoted, shewing that although the first indications of the pen-sack of our modern cuttle-fishes appear to be identical with the shell-gland of other Mollusca, this similarity does not furnish any explanation of its development from the Nautilus.

The paper dwelt on the probability of this Nautiloid origin of the Belemnites, and that they were represented at the present time by cuttle-fish. The internal shell of the modern cuttle-fishes being modified from that of the Belemnites by the loss of the "rostrum" and "phragmocene," and the subsequent prolongation and development of the "conotheca."

The paper was illustrated by anatomical diagrams of the different mollusca mentioned, and led to a long conversation and discussion. Mr. QUILTER afterwards exhibited a very interesting selection of flint implements from Suffolk and the Thames Valley.

J. D. PAUL, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

December 15th, 1886.—The CHAIRMAN introduced a discussion on the question, "Is Bird-song Music?"

It had recently been asserted by the Reverend H. R. Haweis, the Rev. Joseph Wood, and others, that there was no music in nature, and that the song of birds was not music. The question turned upon the definition of the word "music." There could be no doubt that there

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were many musical *tones* in nature, as distinguished from noise, and among these were certainly included the notes of many birds. But it was objected that music consisted of musical tones arranged in musical phrases, and that bird-song was not so arranged. Surely, however, there were phrases of the thrush, the blackbird, the nightingale, &c., which were musical in the truest sense, and could be played upon a musical instrument.

Several members joined in the discussion.

The CHAIRMAN afterwards read a short paper on "Foreign Fruits available for acclimatization in England," describing the processes by which plants might often be rendered hardy in climates to which they were not originally adapted, and pointing out nine useful fruits on which it would be worth while to experiment.

January 19th. 1887.—The CHAIRMAN exhibited a specimen of charred wheat, sent to him by Mr. Ingram, of Belvoir Castle, which was found in an ancient granary, consisting simply of a hole dug in the ground.

Such granaries were used in Romano-British times, and it was not uncommon to find charred grain in them. It was supposed that the charring was for the purpose of hardening the grain, that it might grind more easily; and it was probable that in the process some would be over-burnt and useless, in which case it would be left in the granary. The wheat from Belvoir was burnt through, and crumbled to a black dust. There were marks of fire on the sides of the pit. A number of such pits had been found on the marlstone hills in that neighbourhood.

Mr. Worthington Smith, in "The Gardener's Chronicle," had expressed the opinion that there was no appreciable difference in size of grain between the old British wheat, as generally found in such granaries, and the wheat now sold in English markets. The Chairman suggested that there was, however, probably a difference in the length of ear and number of grains in each, as the wild *Ægilops*, from which wheat was supposed to have sprung, had very few grains in each ear.

The CHAIRMAN then introduced a discussion on "The Relations between Evergreen and Deciduous Trees and Shrubs:—why are some shrubs evergreen and others deciduous? why do the evergreens predominate in tropical, and the deciduous forms in temperate, regions? and why are they everywhere more or less intermixed?" The Chairman pointed out a fact which he had never seen mentioned—viz.: that while the young shoots of deciduous plants were nearly always brown or blackish in the winter, those of evergreens remained more or less green. He exhibited a number of specimens illustrating this. He believed that the physiological difference related to the greater or less necessity for the storage of reserve food according to the climatic conditions under which each species had been evolved.

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Rev. T. A. PRESTON gave an interesting address on "The Observation and Recording of Phenological Phenomena," illustrated by several large and elaborate diagrams, showing the relation between the progress of vegetation in different years and the amount of rain and sunshine. He pointed out the difficulty of carrying on these observations with accuracy and continuity. It was necessary to engage the help of many observers, and then the "personal equation" became a seriously disturbing element. It appeared that the various effects of weather upon plants could generally be traced, but did not show themselves till several weeks after its occurrence.

February 16th.—Miss SLOANE exhibited specimens of two native plants from Croft and Enderby, not recorded for that district in the newly-published "Flora."

Mr. E. F. COOPER, F.L.S., exhibited an interesting collection of seeds, neatly arranged and labelled in a series of small bottles.

Rev. T. A. PRESTON, M.A., exhibited an elaborate diagram, showing the amount of daylight and of direct sunshine for every day during the year 1882. Also specimens of the curious hygrometric plants, *Anastatica hierochuntica* (the true Rose of Jericho) and *Selaginella circinalis*, which contract into balls of apparently dead twigs when dry, but expand in water; and several specimens of the Globe Conferva *(Cladophora œgagropila)* from lakes in Shropshire, each about two inches in diameter.

The CHAIRMAN exhibited one of Baker's Dissecting Microscopes, with which some of the younger members experimented in the dissecting of vegetable tissues. He then introduced a discussion on "The Biological Meaning and Action of a Stimulant," which was carried on in a lively and interesting manner by Dr. TOMKINS, Dr. COOPER, Mr. E. F. COOPER, Rev. T. A. PRESTON, Mr. R. OVERTON, and Mr. J. H. GARNAR, the points in dispute being whether "stimulation" implies the setting free of potential energy, the imparting of kinetic energy, a combination of both, or a special vital action not referable to the known laws of energy.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

January 17th.—A paper was read by the SECRETARY on "The Pharyngeal Teeth of the Chub and Roach."

Dried specimens of the hypopharyngeal bones, with the teeth attached, both of the Roach and Chub, were exhibited, and a section under the microscope showed that the teeth were composed of the non-vascular dentine and osteo-dentine. The anatomy of the parts was illustrated by a dissection of the head of a chub.

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Mr. ROWLEY exhibited a microscopic section of a fossil fish's tooth, known as the "Glass-tip," which well illustrated the enamel tip of the tooth.

Mr. B. HEADLY exhibited skulls of the Hawk's-bill Turtle, the Curlew and Gold-crest.

February 14th.—Mr. G. H. STORER read an interesting paper on "The Starling and its Allies," treating principally of the habits of *Sturnus vulgaris* in the natural state and captivity.

Skins and stuffed specimens were shown of the following species, beside several of the native birds at various ages. From the United States:—The Rice Bird *(Dolichonyx orysivorus)*; Redwing Troopial *(Agelaius Phœniceus)*, a very old male, a male of the first year and female; the Cow-Starling *(Molothrus pecoris)*; with skins of the Maryland Yellow-throat *(Trichas personatus)* and the Golden-crowned Thrush *(Seiurus aurocapillus)*, in whose nests the young Cow-Starlings are reared, these birds having the habits of the common cuckoo as regards nesting; and the Meadow Lark *(Sturnella Ludovicana)*. Also the Jamaica Yellow-bird *(Icterus Jamacii)*; the Baltimore Golden Starling *(Yphantes Baltimore)*; the Great Boat-tail *(Quiscalus Major)*, Purple Grackle *(Q. versicolor)* and the Rusty Grackle *(Q. ferrugineus)*; *Gracula religiosa* and a species of *Acridotheres* from India; and the Scaly Glossy Starling *(Pholidanges leucogaster)*, a beautiful species from Senegal.

March 14th.—The CHAIRMAN gave an interesting discourse on "Muscle," which it was desired by the Section Dr. POPE would allow to appear in the "Transactions," containing as it does a valuable review of the most recent views on the subject as treated by Dr. POPE.

Mr. MONTAGU BROWNE exhibited the eye of a cod which was the subject of a fungoid growth. Similar growth had attacked the cartilages of the skull and penetrated into the cavities.

Mr. W. A. VICE showed the trachea of the Golden-eye Duck *(Clangula glaucion)*, which is remarkable for the enlargement of the central portion, and for the peculiar development at the bronchial extremity into a chamber, part bony, part membraneous, supposed to be connected with the call of the bird.

Mr. ROWLEY had various microscopic slides for exhibition.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "C."

Chairman—C. A. Moore, M.D., 12, King Street.

Secretary—A. F. Atkins, 165, London Road.

This Section meets in the Council Room of the Society, at the Museum, on the second Thursday in each month, at 7.30 p.m.

C. A. MOORE, *Chairman.*

SECTION "D."

Chairman—F. T. Mott, F.R.G.S., Birstal Hill, near Leicester.

Hon. Secretary—Dr. Cooper, King Street, Leicester.

Evening Meetings—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days—The second Wednesday afternoon in each summer month, viz:

April 13.—To the Old Ansty Lane, by 3.30 tram from Church Gate.

May 11.—To Mountsorrel Hill, by train to Sileby.

June 8.—To Swannington Bog, by train to Swannington.

EVENING MEETINGS.

April 20.—Exhibition of Specimens. Subject for discussion—"Cleistogamous Flowers."

May 18.—Exhibition of Specimens. Subject for discussion—"A Botanical Garden for Leicester." Paper by Mr. J. H. Garnar, on "The Entomostraca."

June 15.—Exhibition of Specimens. Subject for discussion—"The zero temperature of Vegetation." Paper by Rev. T. A. Preston, M.A., on "*Carduus Tuberosus*, a rare British Thistle."

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—F. M. Pope, M.B., Campbell House, London Road.

Secretary—W. A. Vice, M.B., 5, Belvoir Street.

The meetings of the Section will be held on the under-mentioned dates, in the Council Room, Town Museum, at 7.30 p.m. Members are desired to bring specimens for exhibition to all the meetings. April 18th, May 16th, June 6th.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART IV., JULY, 1887.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 27TH, 1887.

LEICESTER:
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1887.

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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

At the FIFTY-SECOND ANNUAL GENERAL MEETING of the Society, held in the Lecture Hall, Town Museum, on Monday, the 27th of June, 1887, at 7 p.m.

Mr. F. T. Mott, F.R.G.S., retiring Vice-President, in the Chair.

The CORRESPONDING SECRETARY read the Annual Report of the Council and presented the Reports and Transactions of the Sections.

The Financial Statement, as audited, was read.

Moved by Rev. E. ATKINS, B.Sc., seconded by Mr. T. C. LEE—

"That the Annual Report and Financial Statement be received."

Carried.

Moved by Rev. J. WENT, M.A., seconded by Dr. COOPER—

"That the Annual Report and Financial Statement be adopted and printed for circulation."

Carried.

The CHAIRMAN then vacated the Chair in favour of A. H. PAGET, Esq., the new President, who addressed the meeting.

The PRESIDENT announced the retirement of Mr. W. S. FRANKS, F.R.A.S., from candidature for Council, and declared all the gentlemen nominated for the several offices duly elected, there being only a sufficient number nominated to fill the several vacancies.

Vice-Presidents.

REV. E. ATKINS, B.Sc.	W. N. REEVE, F.S.A.
F. T. MOTT, F.R.G.S.	G. STEVENSON.

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Treasurer.

ALFRED PAGET.

Council.

H. BILLSON.
E. F. COOPER, F.L.S.
REV. A. P. DAWSON, M.A.
J. E. M. FINCH, M.D.
G. B. FRANKLIN.
J. M. GIMSON.
W. JACKSON.
C. A. MOORE, M.D.
J. D. PAUL, F.G.S.
JAMES PLANT, F.G.S.
HENRY TOMKINS, M.D.
W. A. VICE, M.B.

Honorary Secretaries.

CORRESPONDING SECRETARY	C. J. BILLSON, M.A.
MINUTE SECRETARY	WM. SIMPSON, JUNR.
FINANCIAL SECRETARY	GEORGE HULL.

The Election of Officers of Sections was reported.

Moved by Mr. E. T. COOPER, F.L.S., seconded by Dr. POPE—

"That the thanks of the Society be given to the Honorary Secretaries and other Officers of the Society for their services during the past year; to the Representatives and Proprietors of the local Press for their reports of the Society's proceedings; and to the Curator for his services to the Museum."

Carried.

Moved by Mr. T. CARTER, LL.B., seconded by Dr. FINCH—

"That Mr. E. Clephan and Mr. T. C. Lee be elected Auditors of the Society for the ensuing year."

Carried.

Moved by Rev. A. P. DAWSON, seconded by Dr. TOMKINS—

"That with a view to admitting Gentlemen as Associates, Rules XII and XIII be altered so as to read as follows:—Rule XII. The Council shall have power to elect Associates of the Society on payment of Half-a-Guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by tickets not transferable.—Rule XIII. The Council may issue to any Member, Life Member, or Honorary Member, additional tickets available for one Session at 7/6 each; such tickets to be transferable, but to be used only by persons belonging to the Member's household."

Carried.

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THE HAIRLESS CONDITION OF THE HUMAN SKIN.

By F. T. Mott, F.R.G.S. (Read before Section "D," *July 21st, 1886*).

It is commonly assumed that man in some early stage of his history was a hairy animal, and that he has lost his dermal clothing during his long course of development by some selective process either "natural" or "sexual," probably the latter. There is a good deal to be said, however, for the contrary view, viz., that man has never yet acquired a hairy skin.

Tracing up the supposed pedigree of the human race from the amœba, through the worm, the selachian fish, the amphibian, and the pro-mammal, there is no evidence, so far, that man comes from a hairy ancestry. Amœbæ, worms, sharks, and frogs, are naked forms, and that the earliest mammalian type was also naked is, to some extent, indicated by the fact that the young marsupial when transferred to the mother's pouch is entirely without hair.

It is true that nearly all existing mammals are clothed with hair, fur, or wool, but these are the latest products of evolution along lines which have not been followed by the human race. The point up to which the pedigree of man is the same as that of the ape, and at which the two diverge is not precisely known, but is indicated by Haeckel under the name of the semi-ape, an imaginary form in which human and ape-like characters were combined in an embryonic condition. There is no evidence to show whether this semi-ape was a naked or a hairy form, but seeing that all the previous stages in the direct line of descent were naked, it may logically be inferred that the same character was continued, unless there is evidence to the contrary. Now it is pretty clear that the birds are descended from the reptiles, and the reptiles from the amphibians, and that neither birds nor reptiles are in the direct line of the pedigree which leads on from the amphibians to apes and man, but form a divergent branch of which the reptiles are the earlier and primary division, and the birds the later and secondary. What evidence does this line of animal development afford as to the evolution of dermal clothing? All amphibians have naked skin. In reptiles it is clothed with scales, which are merely hardened folds; while the plumage of birds consists of feathers springing from glandular follicles in the same manner as hair. Hence it would appear that the production of cuticular follicles giving rise to hair, is characteristic of the outmost twigs of the tree of life. And this is confirmed also by reference to the fish type. The Selachian fishes, sharks, and rays, which are in the direct line of descent, have no follicles in the skin, neither have the ganoids, the eels,

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or the lampreys, all early forms, while the more highly developed bony fishes, a divergent branch not appearing before the cretaceous epoch, are clothed with true scales arising in the same manner as hair. If, then, man's direct ancestor, the semi-ape, which was directly descended from the pro-mammal and the amphibian, still preserved, as is probable, the naked skin characteristic of the main genealogical line, it is not likely that man would be a hairy animal, unless the human race as we know it now has become a divergent branch.

But there is every probability that the apes constitute a divergent branch, and that man is the continuation of the direct line of descent, the latest link of the chain from which in ages to come other branches may diverge, and still more highly organised forms of life arise to carry on the vital wave to its climax.

Many other facts might be adduced in support of the theory that a natural skin-clothing is one of the latest results of an evolving wavelet of animal life, and that man, as we know him, has not yet reached that critical point in his development. Of all existing human races the lowest are the least hairy. Full beards and hairy arms and legs, are characteristic of the Semitic and Aryan races, not of the Mongols, and still less of the Negroes, the Australians, and the Bushmen. This may indicate that while the direct line of descent is passing through some of the lower human tpyes, perhaps through some isolated group in some yet unknown corner of the world, man, as we know him, has already begun to diverge from the main stock, is already forming another lateral branch, parallel to but higher than the apes ; and is slowly acquiring that natural garment which shall ultimately relieve him from the irksome and costly necessity of manufacturing clothes for his protection.

The fact that there is a great increase in the hairyness of the body, especially of the face, when man approaches the maturity of his life ; and that the same thing happens in many mammals which are hairy from birth, indicates that the clothing of the skin is a natural result of animal evolution.

Among existing mammals there is one type which is a conspicuously naked one, that branch of the Ungulata to which belong the elephant, the rhinoceros, and the hippopotamus. This is a decaying type which has passed its climacteric, and in a few centuries will be extinct, unless man propagates the elephant as a domestic animal. But when this type was in its prime, when the mammoth and the hairy rhinoceros were rulers of the forest world, it was amply clothed and could go anywhere and do anything instead of being confined to a few regions as its inferior representatives now are.

It has been supposed that these animals are unprovided with hair because they inhabit warm countries where such clothing is not necessary, but this is a very superficial and untenable argument. The camel of the desert carries a thick coat, and the lion finds no inconvenience from his heavy mane. Neither can it be that the hippopotamus is unclothed because he inhabits the water, for while the

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whale and the porpoise are naked, seals of all kinds are covered with the densest and most perfect fur. The real cause of these singular differences is no doubt much more fundamental. They depend not upon temporary conditions, but upon the profoundest laws of evolution. Each ripple of the great wave of life, representing a species or a genus or a family, rises through a similar series of phases to its ultimate climax, and according to the phase which that particular ripple has reached at any given period will be the aspect and condition of the forms produced. As the clothing of the tree with leaf and blossom is the latest phase of vegetable life, so it may be the clothing of the skin with fur, and the decoration of the fur with colour is one of the latest results of animal development.

Mammals have not yet reached the stage of colour development, which in some birds seems already to have attained its highest possible expression. The colours of mammals are almost confined to black, white, brown, grey, and tawny, the first faint glimmerings of colour-beauty, while in birds the brilliant secondaries scarlet, yellow, blue, and pink, are frequent, and in flowers still more so. But the unity of the law of evolution will doubtless be affirmed in the future as in the past. Mammals will become brightly coloured, birds will rival flowers, and flowers will paint the world as it has never been painted yet.

Man has existed on this earth for probably 100,000 years. He certainly preceded the last glacial epoch which is calculated to have terminated about 80,000 years ago. The habitable portion of the globe does not exceed one-third of its total surface, yet man has never so far nearly occupied it all. The human population is increasing, however, more rapidly than it ever did before. Civilisation as now understood brings peace to the adult and protection to the infant. The time is approaching when the available area will be fully occupied. Then will arrive that struggle for existence which at many past epochs has done so much to alter the character both of animal and vegetable life.

Then every physical advantage will be selected and perpetuated. Families and races whose development is most advanced will maintain themselves and will have their development greatly accelerated, while the less advanced will rapidly die out. Then the hairiest types which are most able to dispense with artificial clothing will be most able to provide food and luxuries. They will increase while the more naked forms will be eliminated; and in a few centuries men and women will be clothed with natural garments of fine soft fur, probably at first brown, or auburn, but gradually changing as the ages pass to primary and then to secondary tints, till the world becomes gorgeous with a blaze of colour the beauty of which we are scarcely yet able to conceive.

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A NOTE ON NATHANIEL HAWTHORNE.

By C. J. Billson. (Read before Section "A.")

The great writers of imaginative literature may be placed in two classes. Some there are who build upon the foundation of personal experience:—the scenes, the characters, the incidents of their fictions are all more or less drawn from the supplies of their own observation; their modes of thought, their moral convictions, their tastes and feelings are also reproduced from their own reflections and discipline; finally, their style and method of expression is worked out by their own labour, the result of long training and effort. As prominent examples of this class of writers, I may mention the names of Fielding, Thackeray, Dickens, and Walter Besant. The other class consists of those who draw their inspiration not from the world but from within:—the materials of their fictions are supplied chiefly from the stores of ancestral memories; their philosophy is the inherited wisdom of dead thinkers, their style the late flower of prenatal seeds. These two classes are not, of course, mutually exclusive. Some men are born with the gift of style and yet have to seek all their material in the experiences of life; others have inherited the results of experience, and are thus, to a certain extent, independent of the world around them, but they are born without the power of expression. It happens very rarely indeed that all things work together to produce that perfect heritage which is, perhaps, the most easily recognised form of genius. But there are some chosen spirits in whom the converging influences of a favourable ancestry seem to find their focus, who have but to reap the harvest which others have sown. They have not to achieve greatness with labour and vexation of soul; still less is greatness thrust upon them, but they are born great. They do not wait for years to bring the "philosophic mind"—it is their birthright. Such men as these have generally no biographies; before they are born the din of life's conflict has rolled away, and they are the almost passive transmitters of its spiritual results. The burden and heat of the battle was borne by their fathers; upon their happy brows rest perennial crowns of olive.

Of this wise favouritism of Fortune there is no more typical instance than that of Nathaniel Hawthorne. Born in the quiet precincts of Salem—a little town whose very name suggests its life of peace—Hawthorne came early into the enjoyment of his birthright, that spiritual treasure which had been laid up by his Puritan forefathers. He did not draw his inspiration from the common life of action and suffering, nor yet from the world of books, nor did he elaborate a literary style. His gifts were inborn: they came naturally to him. In the first place,

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he was heir to the Puritan conscience. The ineradicable sense of sin possessed his soul, not in the gloomy guise of a superstitious dread, but in such a full measure of wholesome conviction as to form a firm moral groundwork for imaginative studies. But the conviction was not a personal spring of action, so much as an inherited characteristic: and hence its artistic value. For if he had taken life as seriously as the depth of that conviction would seem to require, he could not have sported in those frolics of imagination and fancy. Some wise man said, a short time ago: "No one should take life too seriously. The majority can't; and those who can are just those who shouldn't." However this may be as a general rule, it is at any rate a maxim which holds good for the artist: he must play with the burden of life, or it would crush him.

Hawthorne certainly had a native tendency to gloomy themes, but his treatment of them is never gloomy. Never was critic more emphatically "out of it" than the Frenchman who called Hawthorne a pessimist. Why, the simple artistic nature of the man enabled him to throw a ray of sunlight over the darkest subjects. He had, no doubt, a constitutional weakness for melancholy topics, but of constitutional melancholy I should say he had as little as most men. There is, it is true, a certain dry light of imagination in all his work, an air of abstraction from the general heart of man; but this I should attribute, not to any misanthropy or pessimism, but first and chiefly to his Puritan heritage, and secondly to his personal distaste for society and love of "cool solitude." He was, as he says, "on most occasions fonder of being absent than present." There is, in fact, a lack of the personal element. An eager intercourse with the world might have altered this; it might have rendered him more sympathetic and impassioned, but, on the other hand, it would have weakened his inborn grasp on the reality of life. It was just his reserve and aloofness which kept him so true to the ancestral message. He would not have been Hawthorne if the stern voices of his Puritan forefathers had been drowned by the clatter of social life. His special rôle, the thing he came into the world to do, was to unlock the spiritual treasure which they had gathered. And he did it by isolating himself from the practical problems of his own day. And what a rich hoard it was! Surely it is as true in the moral economy as in the political, that the miser confers more benefits upon society than the spendthrift.

Hence, too, the weird character, the impalpable and inactual atmosphere of Hawthorne's writing. His words seem to come from a distance. His voice is not the strenuous tongue of a man among men, but rather like the mingled murmur of a thousand unearthly spirits who have found in him their destined utterance. All his tales have that charm of remoteness which is the essence of romance. The scene passes behind a veil of twilight. The characters do not stand out in sharp outline: they are mysterious, wavering, suggestive—not transcripts, but types of human nature. Undoubtedly Hawthorne sometimes indulged too far that tendency to symbolism which ran in his blood—in some parts of "The Scarlet

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Letter," for instance, and in "Transformation." In both these books there is a certain amount of mistiness, which is not the summer haze of imagination, but a sheer November fog of queer similitudes and ill-connected thoughts. And sometimes there are, on the contrary, odd little bits of minute realism. But, to speak generally, Hawthorne kept the balance true and walked in the strait path of idealism, seldom looking to the right hand and seldom to the left, though perhaps always too easily taken by shadows and similitudes.

Of the multitudinous tale-writers of the present day I know only one who at all resembles Hawthorne in his purely idealistic treatment of moral themes through the medium of a perfect prose style, and that one is Robert Louis Stevenson. Stories like "Markheim" and "The Strange Case of Dr. Jekyll and Mr. Hyde" seem to have strayed out of some unpublished volume of "Twice Told Tales." In the "New Arabian Nights," "The Dynamiter," or "Prince Otto," there is just that twilight atmosphere of romance which pervades the stories of Hawthorne. In reading either of these writers we seem transported into another world which is as a type and shadow of this, a world unique but consistent with itself. Stevenson lays more emphasis than Hawthorne did upon the irony of life, but it is difficult to think of any two equally humorous writers who are less satirical than these.

However, I do not wish to do more than suggest the kinship of these powerful idealists. The time has not yet come for any detailed comparison between them. Hawthorne has taken his place among the immortals: Stevenson has yet to make good his title to a corner of Parnassus; he has only given us his "Twice Told Tales,"—he has yet to give us his "Scarlet Letter" and his "House with the Seven Gables."

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

This Section has not met during the past quarter.

W. JACKSON, *Chairman.*

SECTION "B."

FOR ASTRONOMY, PHYSICS AND CHEMISTRY.

See Annual Report, p. 35.

E. ATKINS, *Chairman.*

SECTION "C."

FOR GEOLOGY.

This Section has not met during the past quarter.

J. D. PAUL, *Chairman.*

SECTION "D."

FOR BIOLOGY (BOTANY AND ZOOLOGY).

March 16th, 1887.—The CHAIRMAN read a short paper on "The Voices of Animals," showing that voice was only possible in the air-breathing vertebrates, and was in fact only developed to any important extent in the two classes of Birds and Mammals.

Mr. E. F. COOPER, F.L.S., exhibited a number of large coloured and very excellent German plates of grasses and other agricultural plants.

Mr. GRUNDY a small tray of marine shells.

Mr. H. E. QUILTER a shell of *Nautilus Pompilius*, cut through and showing very perfectly the chambers and the syphon-channel.

Dr. FINCH an extraordinary example of the creeping root-stock of the nettle, *Urtica dioica*, about six feet long, very much branched, and in some parts three-quarter of an inch thick; also a specimen of the rook with the lower mandible broken and the upper one grown abnormally to three inches in length, curved and hooked.

The CHAIRMAN introduced a discussion on "The Relations between Univalve and Bivalve Shells," the question in dispute being whether the

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operculum of univalves is really a second valve or an organ which has no homologue in the bivalve. Gray argues that it is a second valve because its structure is the same, with the same spiral character, and with the spiral turned the contrary way to the other valve; but the fact that it is secreted by the foot and not by the mantle is opposed to this theory, and the most recent writers seem to consider that it is not a true valve.

The discussion was continued by Mr. QUILTER, Dr. TOMKINS, Dr. COOPER, and others.

April 20th, 1887.—The CHAIRMAN thanked the members for their confidence and assistance during his three years of office.

He thought it was undesirable to make the post a permanent one; that a change of leadership would tend to freshness and vigour, and that all the active members of the Sections should occupy the chair in turn. He wished, therefore, to resign the post, and moved that Dr. TOMKINS, Officer of Health for the Borough, be elected Chairman for the ensuing year from June next, and that Dr. C. W. COOPER be re-elected Hon. Secretary. The motion was carried unanimously.

Mr. E. F. COOPER, F.L.S., exhibited a flowering branch of a *Eucalyptus*, probably *globulus*, received with other cut flowers from the Riviera.

Rev. T. A. PRESTON, M.A., specimens in spirit of the floating seaweed, *Sargassum bacciferum*, and of a number of small marine animals taken among the living weed in the Sargasso Sea, including *Medusæ*, several small fish and crustaceans, the Trigger-fish, a small cephalopod, &c.; also a specimen of the curious fungus, *Geaster fornicatus*, the "vaulted earth-star."

Mr. W. A. VICE, M.B., three interesting fungi, collected at Blaby, viz., *Hypoxylon concentricum*, a solid black mass two inches long; *Cucurbitaria laburni*, and *Podisoma Sabinæ*, the first two new to the County, and the third new to the Leicester district.

The CHAIRMAN reported that at the Field Day Excursion on the 9th, the first of the season, six members visited the old Ansty Lane. The day was dull and cold, but they collected nine species of mosses, among them being *Brachythecium glareosum*, new to the county; two species of Hepaticæ, one being *Lophocolea heterophylla*, in full fruit; and five species of land Shells, among them a single specimen of the rather rare *Bulimus obscurus*, and a whole community of the pretty *Helix rotundata*, under the bark of an old stump.

Mr. E. F. COOPER and the CHAIRMAN then introduced a discussion on "Cleistogamous flowers," pointing out that whereas Darwin had shown the importance of cross-fertilization, and the many remarkable contrivances among plants for securing it, it was found that a considerable number of plants bore, in addition to their ordinary flowers with open coloured corolla, other flowers generally without corolla and never opening at all, which seemed purposely formed for securing *self*-fertilization, and which generally perfected seed, while many of the open flowers were barren. These closed and inconspicuous flowers were called "cleisto-

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gamous." What was their real purpose? Mr. E. F. COOPER showed fresh and dried specimens of *Viola hirta*, *V. odorata*, and *V. Riviniana*, bearing flowers of both kinds. Darwin suggests that the closed flowers are degraded organs for securing ripe seed at the least possible cost of energy to the plant. The CHAIRMAN believed, on the contrary, that they were survivals of an early form of the reproductive organs, before the corolla-bearing epoch was reached.

May 18th, 1887.—Mr. J. H. GARNAR read a short paper on "The Entomostraca," describing some personal observations confirming the published views of Dr. Baird, and illustrated by living specimens exhibited under the microscope as well as by a number of mounted slides.

Mr. W. A. VICE, M.B., exhibited specimens of ripe loquats *(Eriobotrya japonica)*, sold in the streets of London; also several fungi.

Rev. T. A. PRESTON, M.A., a beautiful microscopic slide of *Amphioxus*, with several other examples of it in spirits; and a specimen of the curious fungus, *Cordyceps entomorrhiza*, growing on a caterpillar, from Norfolk.

The CHAIRMAN, Dr. Cooke's work on the British Myxomycetes, translated from the Polish.

The CHAIRMAN reported that the Field-day Excursion on the previous Wednesday was attended by six members, who visited the Gardens at Belvoir Castle, under the guidance of Mr. INGRAM, and were delighted with the beauty of the spring flowers. Camellias and Himalayan Rhododendrons, which have remained in the open air without protection for many years, were in full bloom, and a number of rare and beautiful hardy herbaceous plants were seen, with a fine collection of varieties of *Narcissus*.

Mr. THOS. CARTER, LL.B., introduced a discussion on "A Botanical Garden for Leicester." He said that in France there was a system of such gardens in the principal provincial towns, all in connection with the central gardens at Paris, a system which dated from the great Revolution; that while travelling in France he had found these gardens very useful, and that such a garden in Leicester would greatly facilitate the study of Botany. The discussion was interesting and lively.

The CHAIRMAN produced a rough design which he had sketched for a very complete Botanical Garden of ten acres, in which visitors would pass successively through Arctic, Temperate, Sub-tropical and Tropical floras, and in which there would be special departments also for the local flora, medical plants, hardy fruits and vegetables, agricultural plants with experimental grounds, and a type series illustrating the botanical Orders. It was finally determined that Mr. Byrne, of the Abbey Park, should be consulted as to the possibility of some small beginning being made there, and that if it seemed possible, the Park Committee should be approached on the subject.

F. T. MOTT, *Chairman.*

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SECTION "E."

FOR ZOOLOGY.

April 18th.—Mr. H. E. QUILTER read a paper upon "*Helix nemoralis*, the common banded Snail."

Mr. QUILTER briefly sketched the development of the animal from the egg state, and treated more especially of the great variations which occur in the colouration and markings of the shell in this snail; and of the various modes of classification which have been suggested.

The paper was illustrated by numerous examples of the varieties, arranged to show the two more generally accepted methods.

May 16th.—Mr. B. HEADLY exhibited a specimen of a curious fish from the Indian Seas, belonging to the order of *Rays*; remarkable for the great length of the tail—two yards and a half—which in the dried state was for most of the length about the thickness of whipcord.

Mr. F. F. HOWE showed a very interesting collection of insects and spiders from Australia, most orders being represented.

The SECRETARY read some "Notes upon a Parasite from the mouth of the common perch."

This appears to be *Acthères percarum*, one of the parasitic crustacea; though the specimens differed from the illustrations in the works available. About 20 of these were found adhering to the inner surface of the mouth in various positions; specimens under the microscope showed the curious modifications of the anterior limbs, which in this the adult form of the female join together at the extremity and develop a disc, by which a secure attachment is made to the surface of the host. The curious external ovisacs were also shown, into which the eggs pass after development.

June 6th.—Mr. W. ARMSTON VICE was elected Chairman, and Mr. F. R. ROWLEY, Secretary.

Mr. ROWLEY read a paper upon "The Respiratory Organs in various animals."

Mr. QUILTER exhibited skulls of Fallow-deer, (young and adult) from Bradgate Park.

Mr. W. A. VICE showed specimens of two nearly allied species of *Bibio; B. anglicus*, Verrall; and *B. ferruginatus*, Meigen. The former was described for the first time by Mr. VERRALL in 1869, and has been since taken by him in several counties; it occurs plentifully at Newmarket, Cambridgeshire. *Bibio ferruginatus*, has been found during the last two seasons near Leicester; Mr. VERRALL had not previously seen British specimens, and the description by Walker under this name, was evidently of another species.

F. M. POPE, *Chairman*.

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Announcements.

GENERAL MEETINGS.

1887.
Oct. 10.—Inaugural Address of the PRESIDENT.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. W. JACKSON.
Secretary—Mr. JOHN SCAMPTON, 1, Pelham Street.

1887.
Oct. 18.—Mr. W. JACKSON. Introductory Address.

SECTION "D."

Chairman—HENRY TOMKINS, M.D., Fosse Road, Leicester.
Secretary—C. W. COOPER, M.B., King Street, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

FIELD DAYS—The second Wednesday afternoon in each summer month, viz:

July 13.—To Piper and Oakley Woods, by train to Hathern.

Aug. 10.—No Excursion.

Sept. 14.—To Mountsorrel Hill, by train to Sileby.

EVENING MEETINGS.

July 20.—Exhibition of Specimens. Paper by the CHAIRMAN on "*The active principle of Vegetable Poisons.*"

Aug. 17.—No Meeting.

Sept. 21.—Exhibition of Specimens. Paper by Mr. F. T. MOTT, F.R.G S., on "*The Songs of some Leicestershire Birds.*"

HENRY TOMKINS, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART V., OCTOBER, 1887.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
1887.

[*Price Sixpence.*]

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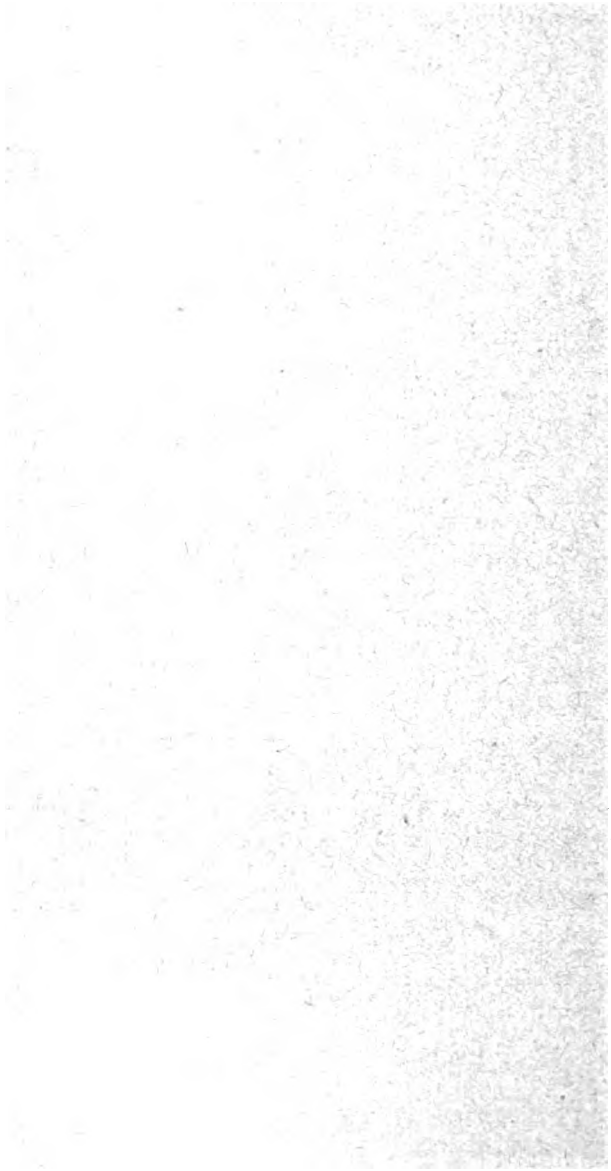

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1887-88.

President:

A. H. PAGET.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
W. N. REEVE, F.S.A.
GEORGE STEVENSON.

Council:

Retiring June, 1888.	Retiring June, 1889.
R. HARVEY, LL.B.	H. BILLSON.
T. CARTER, LL.B.	E. F. COOPER, F.L.S.
C. W. COOPER, M.B.	REV. A. P. DAWSON, M.A.
REV. J. WENT, M.A.	J. E. M. FINCH, M.D.
W. KELLY, F.S.A., F.R.H.S.	G. B. FRANKLIN.
T. C. LEE.	J. M. GIMSON.
J. H. GARNAR.	W. JACKSON.
E. CLEPHAN.	C. A. MOORE, M.D.
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Fortnightly, on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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ON THE VOICES OF ANIMALS.

By F. T. Mott, F.R.G.S. (Read before Section "D," *March 16, 1887.*)

In the slow unfolding of the Organic Force-wave, the faculty of Voice appears to be one of the latest developments. Voice, as a means of communication between individuals, would of course be useless unless the faculty of Hearing were also evolved either previously or simultaneously. But there are many other sources of sound in the world besides Voice, and the faculty of Hearing, as applied to these, did, in fact, long precede the development of Voice.

The whole organic world, vegetable and animal, is voiceless, with the exception of the vertebrates. Voice implies an internal air-breathing apparatus, consisting of an air-reservoir surrounded by contractile muscles, from which a current can be forcibly expelled through a suitable orifice within a resonant cavity. Voice is the sound of a wind-instrument. We may speak with correct analogy of the voice of a trumpet, a flute, or a clarionet, but not of a piano or a violin. These latter have their analogues in the chirping of the cricket and the grasshopper, and the humming of the bee. All sound is dependent upon vibrations of the air, but while wind-instruments produce these vibrations in the interior of a hollow cavity, all others produce them externally in the open atmosphere.

The necessary apparatus for the natural production of voice exists only in vertebrate animals, and not in all of them. Fishes breathe water, and are incapable of voice. In amphibians and reptiles the respiratory apparatus is feeble, and voice is but feebly developed. In birds and mammals it is strong, and in man it amounts to speech. It seems natural enough that this gift should be more highly developed in man than in the other mammals, considering his superior position among them; but why should birds alone of the other vertebrates have the power of song, and why among these should it be confined to the smaller forms? The most probable explanation is that birds represent the climax of the amphibian or reptilian branch of the great organic wave; that their rank with respect to reptiles is co-ordinate with that of insects to crustaceans, and of man to mammals; and that the gift of voice is one sign of their position in the organic scale. That the highest gifts should accompany diminished size is a fundamental law of organic development; the gigantic races of all great classes occupy a middle rank between the embryonic and the perfected forms.

Comparing the two great vertebrate classes of birds and mammals in which alone voice becomes an important and conspicuous faculty, the same progressive development of this faculty from the lower to the higher orders in each class is very clearly traceable:—in birds, from the harsh

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quacking and screaming of the ducks, the curlews, and the hawks, the crowing of the fowls and pheasants, the softer notes of the doves and cuckoos, the varied whistling powers of the parrots, and, finally, the modulated songs of the small but clever warblers; in mammals, from the noisy bellowing and braying of cattle and horses, the sonorous roaring of the carnivora, the expressive chatter of the monkeys, up to the speech and song of man. In these graduated scales there are some exceptions, as in the soft breeding-song of the common swan, and the almost musical cry of the pee-wit; but these probably represent forms which are high in rank in their respective families, and the general advance from the lower to the higher orders is manifest.

Comparing, however, this faculty of voice in the whole class of birds with the same faculty as it exists in mammals, a remarkable difference is to be noted in the apparatus by which it is produced. In birds, the larynx in which the vibrations originate is situated at the lower end of the trachea, or windpipe, just before the point where it divides into the bronchial tubes; while in mammals the larynx is at the upper extremity of the windpipe, just where it enters the pharynx behind the cavity of the mouth. This difference is the more remarkable from the fact that in reptiles, from some early form of which the bird-type seems to have been developed, the larynx is in the upper part of the trachea, as in mammals, although only in a few species are there any vibrating membranes.

The kind of voice which can be produced by such a wind-instrument as a larynx is dependent upon many factors. The form, the density, and the tension of the vibrating membranes, the form and structure of the windpipe and of the mouth, the power and complexity of the regulating muscles, and, finally, the intellectual capacity which recognises minute differences among sounds and distinguishes music from noise, must all enter, more or less, into the problem. Higher rank in the scale of organic life always implies greater complexity of details, and as the production of music requires a more complex apparatus than the production of noise, while articulate speech demands an instrument still more elaborately constructed than a flute or a trumpet, so it is easy to comprehend how birds may be musical while man alone has the true gift of language. The essential difference between human speech and what we call the "inarticulate"—that is, indistinct—cries of other animals, lies, firstly, in the greater complexity of the muscles of the larynx and mouth giving a much greater range with the capacity of producing very small variations, and, secondly, in that superior intellect which makes man able to appreciate those small variations, to remember them, to imitate them at pleasure, and to associate them with the still more delicate variations of thought. There can be little doubt that the cries of the lower animals are languages of a simpler and more imperfect type than ours, but serving the same purposes—the expression of feelings and the communication of ideas. The dog barks and howls and whines with considerable variation of tone and timbre, and his varied calls are comprehended by his asso-

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ciates in the same way as speech is comprehended by human beings, though with much less definiteness, because there is in the dog's larynx and mouth nothing like the same capacity of variation, nor in his brain anything like the same intellectual power of perception and reflection.

The capacity which some birds possess of whistling artificial airs, and even of uttering human speech, seems to depend entirely upon the imitative faculty. Some amount of association between sounds and circumstances enables them to utter certain phrases with strange appropriateness, but it is clear that they have little intellectual perception of the meaning of such phrases, and no special enjoyment of the musical airs which they are taught to sing. In what way they contrive to imitate human speech, with an apparatus so differently constructed, is a little mysterious. Many birds, however, can be taught to do this—magpies, jays, blackbirds, starlings, and especially parrots. In nearly all birds the upper mandible, or jaw, is moveable, but in parrots this character is especially marked, the upper mandible being articulated to the skull, so that it can be used as a third foot or as a finger. The solidity and arched form of the grey parrot's bill, its thick fleshy sensitive tongue, the particularly complex muscles of its larynx, and the high development of its brain in comparison with most other birds, are no doubt the principal causes of its superiority over all others in the imitation of human language. The earliest record of talking parrots is about 450 B.C., a century before the time of Aristotle. They are not mentioned in the Bible. It is said that nearly every race of Savages within the tropics has tamed some species of parrot.

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FOREIGN FRUITS AVAILABLE FOR ACCLIMATIZATION IN ENGLAND.

By F. T. Mott, F.R.G.S. (Read before Section "D," *Dec. 15, 1886*).

In the gardens of England at the present time only about 22 distinct kinds of fruit, hardy and half-hardy, are commonly grown.

The following list is fairly exhaustive, viz. :—

HARDY TREES.

Apple	Quince
Pear	Medlar
Plum	Mulberry
Cherry	Walnut
Crab	Sweet Chestnut

HALF-HARDY TREES OR SHRUBS.

Apricot	Grape
Peach	Fig
Nectarine	

HARDY SHRUBS.

Gooseberry	Raspberry
Red Currant	Barberry
Black Currant	Nut

HARDY HERB

Strawberry

To these may be added, as occasionally but not commonly cultivated, the Service, Azarole, Arbutus, Elder, Cranberry, and Blackberry, with the Tomato which is more used as a vegetable than a fruit.

It is difficult to say how many botanical species are represented in the above list. Most of the fruits now grown are hybrids. The distinct varieties which cultivators have produced, and which are grown in various parts of the country are very numerous, probably not less than 3,000.

About half of the 22 fruits commonly grown in our open gardens have been derived from native species improved by cultivation and crossing. The other half are importations chiefly from southern Europe and western Asia. The Romans probably brought us the Chestnut, Grape, Pear, and Plum ; and the 16th century Renaissance which gave a new impulse to gardening in common with other arts, enriched our orchards and fruit gardens with the Walnut, Quince, Peach, Nectarine, Mulberry and Fig.

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Since that time we have wonderfully improved nearly every one of our hardy fruits in size and quality, but no new kind has been introduced, or none at least has become popular.

Does the wide world afford no other fruit worth cultivating and capable of flourishing in our English climate?

Three years ago I published a catalogue of the Fruits of all Countries in which 515 species are enumerated and briefly described. Chiefly from this catalogue I have selected nine which seem to offer a fair chance of success to an enterprising cultivator who will apply his energy and skill to their introduction and development.

In the countries of southern Europe is found a small thorny tree, *Zizyphus vulgaris*, which produces a yellow fruit of pleasant flavour, the size of a small gooseberry. These fruits are usually dried and sold under the name of Jujubes, the gelatine jujubes of our shops being named after them.

There are several other species of *Zizyphus* cultivated in China, Japan, India, and North Africa all bearing good fruits yellow or purple in colour. The African species *Zizyphus Lotus*, is probably the tree whose purple fruit was eaten by Homer's "*Lotophagi*," and Tennyson's Lotus-eaters.

It is probable that no species of *Zizyphus* in its present condition would ripen its fruit in English gardens, but the art of cultivation consists in so modifying the natural habits of plants as to adapt them to man's needs in various climates. This is accomplished by selection, propagation by seed, changes of soil, and gradual exposure.

The first step would probably be to obtain a hardy variety of the *Zizyphus vulgaris* regardless of the quality of the fruit. A tree should be selected in the most elevated and exposed situation in which it naturally ripens its fruit. Seeds from this tree should be grown in a slightly colder climate, and if any of them can be got to ripen fruit, the seeds of these should be again reared still further north. In this manner the tree might gradually be acclimatized in our southern counties. Having once obtained a sufficiently hardy stock, the next process would be to improve the fruit. This would be done by selection of seed with reference to the fruit rather than to the hardiness of the plant, by crossing with Indian or Chinese species, and by careful study of soil and general treatment.

The process of thus producing a new hardy fruit would be tedious, because fruiting trees can scarcely be brought to such a state of maturity as to show their true characters in less than eight or ten years from the sowing of the seed, and five or six generations at least might be required to produce any useful result. But the experiment would be interesting in all its stages, and the object if ultimately attained would be of great value.

The next plant which I would commend to the notice of horticulturists is *Eugenia Ugni*, a small tree allied to the Myrtles, a native of Chili, and

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probably not more tender than the common Myrtle, which will bear almost any English winter in our southern counties.

The genus *Eugenia* is a very large one, containing about 500 species, nearly all tropical, and distributed all round the world. About fifty species yield edible fruits, the East Indian Rose-Apple being one of them. Cloves and Allspice are the produce of two other species. Fortunately there are several of the Engenias which have crept out beyond the tropics, and among these is *Eugenia Ugni*, which flourishes in Chili in a southern latitude of about 35° equivalent to the South of Spain in the Northern hemisphere. The fruit of this tree is a glossy black berry of fine flavour. The fruit has been brought to perfection in English greenhouses, and there seems no reason why it should not be acclimatized by the raising of hardier varieties, and the fruit improved in size and quality by selection and crossing.

There is a curious shrub—*Decaisnea insignis*—found on the Himalayas of Sikkim at an elevation of 10,000 feet under a latitude of 28° north. This must represent a climate by no means tropical at all seasons of the year. The fruit of this shrub consists of several follicles like that of the pœony but filled with a delicious pulp. It would be altogether a novelty in our gardens, but not much is known at present of its capabilities, as it was only discovered some 20 years ago.

Diospyros Kaki, the Chinese Date-plum, bears a large red berry with a sweet yellow pulp, which is said to be in all respects equal to our best Apricots. It is cultivated in the open air on the northern shores of the Mediterranean, and as it is a native of Japan and northern China, it should not be impossible to acclimatize it in this country. There is another species, the *Diospyros Lotus*, which is indigenous in southern Europe, but of which the fruit, resembling a yellow Cherry, is not nearly so good as the Chinese Date-Plum. Hybrids, however, between these two might prove hardier than either of them.

New Zealand and Japan occupy similar latitudes, north and south of the equator. It is the latitude of Spain and Greece, and many plants are grown in English gardens which have been introduced from these countries. In New Zealand there is a small native tree *Corynocarpus lævigatus*, allied to the Mango, which bears a sweet, pulpy, edible fruit, the size of a plum, with a farinaceous seed which is also edible when cooked. This plant is grown in our greenhouses as an ornamental evergreen, and would probably repay the trouble of acclimatization.

But there are several fruiting plants deserving the attention of cultivators, which, being already hardy, require only to have the quality of their fruits improved. Among these are *Cornus frayifera*, an evergreen shrub from the Himalayas and Japan, bearing an agreeable red fruit, about the size of a strawberry; *Amelanchier Botryapium*, the American Grape-Pear, a deciduous shrub allied to the Medlar, which ripens its small purple fruit about Midsummer; *Elæagnus hortensis*, the Oleaster, a small deciduous tree bearing fragrant flowers and red berries, which the Persians call Zinzeyd, and which resemble the jujube in flavour; and

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Viburnum edule, the Elk-Berry, a Canadian shrub of which little seems to be known in England, although some recent travellers have reported the berries to be edible and wholesome.

Doubtless among the 500 fruits wh ch are yet unknown in English gardens, there are many others waiting for the Coming Man whose genius shall master all the difficulties, break down all the natural barriers, prove the triumphant power of human art, enrich our orchards with a crowd of beautiful and delicious fruits, and thus confer upon his fellow-countrymen a never-to-be-forgotten benefit.

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A GREAT LITTLE CITY.

By CHARLES J BILLSON, M.A. (Read before Section "A.")

One of the most noteworthy facts of our time is the spread of cosmopolitan feeling. It is a fact, no doubt, to be accepted with a welcome. At the same time one cannot help looking back, with at least a passive regret, upon those more simple forms of brotherhood which marked an earlier stage of social development. The family, the tribe, the city, the nation, the empire ; each of these has been, in its turn, the highest object of political devotion : and, although the best thought of our own day recognises the claims of the whole human family as paramount over those of any particular state, yet we can hardly be said to have passed out of that state of feeling to which Patriotism, national or imperial, seems the most pre-eminent of the political virtues. It still goes against the grain to subordinate our love of England to the love of Humanity. But, at any rate, some centuries have passed since the civilised world lost almost all traces of that phase of political feeling, which preceded Patriotism, properly so called, and in which the spirit of township was exalted into a religious sentiment. The most memorable and splendid examples of this phase of civilisation are furnished by the City Republics of Italy, and, perhaps even more strikingly, by the towns of ancient Greece, as they are pictured to us in the pages of Herodotus and Thucydides. For in the Greece of Herodotus and Thucydides the bond of Hellenic unity had failed to unite the various towns and cities of the mother country into any durable nationality. Each township stood out from the rest as an isolated centre of feeling, and the word most frequently occuring in the political discussions of that era is the word *αὐτονομία*, Self-government, or Home Rule. The spirit of national life existed only in the germ : the Greek citizen lived and died for his city. To take the most brilliant instance ; it is utterly impossible for us at the present day to form any true idea of the intense and religious enthusiasm which the very name of Athens woke in the hearts of all her sons. She was not only the city of their fathers, beautiful with all the best gifts of art and nature, but she was also the peculiar abode and favourite seat of the patron goddess Athene, who is the purest saint in the Greek calendar, the catholic ideal of culture. The poets hymned her glories with a passion equalled only by that of the Exiles of Babylon, who remembered Sion. And the love which the Athenian felt for his bright home, the "splendid city," the "city of the violet garlands," is but one example among many of the civic devotion of the Greek. Another illustration, not less remarkable, is furnished by the story which I am going to repeat.

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On the high road leading from Athens to Thebes, between the heights of Cithæron and the river Asopus, lay the small Bœotian township of Platæa. At the most prosperous period of its existence, Platæa contained perhaps as many inhabitants as Lutterworth has at the present time, but generally it was a much smaller town than Lutterworth. And yet, this "little city with few men in it," has built herself a very famous name, which time can never rust, by the sheer force of her civic spirit. The roll of her citizens contains the names of no great men; she contributed nothing to Art or Literature or Philosophy. But the heroism of her united action, loyalty, and resolute endurance, forms one of the most instructive, as it is one of the most interesting, of all the pages of history.

Only eight miles distant stood the important city of Thebes, and our little town was continually harassed by the aggressions of her powerful neighbour, who claimed to possess a protectorate over Platæa, which the latter refused to acknowledge. Finding it impossible to hold their own, the men of Platæa were compelled to apply, apparently in the year 519 before Christ, for the protection of Sparta. But it never entered into the scheme of Lacedæmonian policy to undertake an unprofitable trust, and the baffled Platæans were turned back to appeal to the generosity of Athens. They sent messengers to the great city, who took their seats before the altar on a day of public sacrifice, and offered to give up their town to the Athenians if they would but aid them against the insolence of Thebes. In need hardly be said that Athens would lose far more than she would gain by accepting the Platæan alliance at the expense of Theban jealousy, but the appeal to the impulsive chivalry of the Athenian character proved successful, and the envoys withdrew with the promise of Athenian help. It was soon required and given. When the Thebans again came out to attack their little neighbour, they were confronted by a body of soldiers who had been sent from Athens to defend the new ally. At this juncture an offer of mediation arrived from the Corinthians, and both Thebans and Athenians agreed to submit the question of Platæa's political status to the arbitration of Corinth. The arbitrators decided that Platæa was independent of the Theban protectorate, and that the Theban assault was in no way justified. So the two armies separated, and the Athenians started on their homeward march. They had not gone far, however, when they were treacherously attacked by the Thebans, who declared that they would not accept the ruling of Corinth. In the battle which ensued the Athenians were completely victorious. Their success won for them the hatred of Thebes, and also, what they probably then held of little account, the warmest friendship of our little city.

Before that generation had passed away, the Platæans had a brilliant opportunity of showing their gratitude to Athens for her disinterested conduct. When 10,000 Athenians were mustered at Marathon in the face of the Persian host, deserted by Sparta and by every other Greek state, alone prepared to do battle for the cause of Liberty against the powers of the despotic East, they were joined, on the eve of the great

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battle, by the whole force of Platæa, consisting of about 1000 men. "Their coming on this important occasion," says Grote, "seems to have been a spontaneous effort of gratitude. . . . . If we summon up to our imaginations all the circumstances of the case, we shall be sensible that this volunteer march of the whole Platæan force to Marathon, is one of the most affecting incidents of all Grecian history. Upon Athens generally, it produced an indelible impression, commemorated ever afterwards in the public prayers of the Athenian herald, and repaid by a grant to the Platæans of the full civil rights (seemingly without the political rights) of Athenian citizens. Upon the Athenians then marshalled at Marathon, its effect must have been unspeakably powerful and encouraging as a proof that they were not altogether isolated from Greece, and as an unexpected countervailing stimulus under circumstances so full of hazard."

Athens never forgot her brave little ally, who proved then, as ever afterwards, faithful unto death.

Eleven years after the battle of Marathon, Platæa gave her name to the great victory which the Greeks under Pausanias obtained over the Persians on the banks of the Asopus. In the muster-roll of the Greek army we find 8000 Athenians and 600 Platæans fighting together side by side under the command of Aristides; and we are told by Plutarch that after the battle the Platæans received by general vote the prize of valour. This is doubtful, but it is at any rate certain that they were richly rewarded. In the Market Place of their town Pausanias offered a sacrifice of thanksgiving, and we are told that they received no less than 80 talents out of the prize money, to enable them to commemorate the great victory. A part of this sum was devoted to building a beautiful temple of Athene, a graceful record of their friendship with Athens. All the Greeks who fought in the battle bound themselves by an oath to guarantee the independence of Platæa.

But lapse of time failed to abate the inveterate enmity of Thebes. This independent little neighbour was a bitter thorn in the side of her growing power, and in the year 431, in another effort to snatch the tantalising prize, which lay almost within sight from their own walls, the Thebans struck the first blow of the great Peloponnesian war. The town spirit of Platæa had for once failed her. "Certain men of the Platæans," says Thucydides, "called in the Thebans, and opened the gates to them, wishing to put the city into their hands. For the Thebans wished to surprise Platæa while it was still time of peace, and the war had not openly broken out." Accordingly, on a rainy night towards the end of March, a body of some 300 Thebans presented themselves at the gates of Platæa, during the first sleep of the citizens, and entered easily without being observed, as no guard had been set before the gates. After piling their arms in the Market Place, they made proclamation that whoever wished to make an alliance with them should come and pile his arms with theirs, supposing that the city would easily come over by this method. And at first the surprised inhabitants thought of

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making terms, for they believed that the Thebans were more numerous than they were. But afterwards they determined to attack them. "They proceeded to join each other by digging through the partition-walls of their houses, that they might not be seen going through the streets, and set waggons without the cattle in the streets to serve for a barricade, and got everything else ready. Then, having watched for the time when it was still night but the day was about to break, they began to go out of their houses against the Thebans, and came to close quarters with them as quickly as they could. Twice or thrice the Thebans beat them off; but afterwards, when the men were assailing them with a great clamour, and the women and slaves were raising a loud shouting and screaming from the houses, and pelting them with stones and tiles, and a violent rain had come on in the night, they became frightened, and turned and fled through the city, the greater part of them, through the dark and dirt, unacquainted with the ways out by which they were to save themselves, while their pursuers knew them, so that many were put to death. Moreover, one of the Platæans had shut the gate by which they had entered, and which was the only one opened, by driving the spike of a spear into the bar, instead of a bolt; so that there was no longer any way out even by that. As they were chased up and down the city, some of them mounted the wall and threw themselves over, and most of these perished: others came to a deserted gate, and a woman having given them an axe, cut through the bar without being observed, and went out, but in no great numbers, for it was quickly discovered; while others met their fate scattered about in different parts of the city. But the largest and most united body of them rushed into a spacious building which joined on to the wall, and the near door of which happened to be open, thinking that the door of the building was one of the town gates, and that there was a passage straight through to the outside. When the Platæans saw them cut off, they consulted whether they should burn them where they were by setting fire to the building, or treat them in any other way. At last both these and all the rest of the Thebans that were left alive wandering up and down the city, agreed to deliver up their arms and themselves to the Platæans, to do with them as they pleased."

A relieving force of Thebans, whose march had been delayed by the heavy rain and the flooded river which they had to cross, now appeared under the walls of the town. But they retired without doing any injury, induced, as they said afterwards, by a promise of the Platæans to spare the Theban prisoners. The Platæans denied that they ever made such a promise. At any rate "they put the men to death," says Thucydides, "to the number of 180." Diodorus tells us that the Platæans handed back their prisoners to the Thebans, and although his statement cannot, of course, be accepted in the face of Thucydides' express contradiction, it is nevertheless interesting as showing the traditional reputation for chivalry of this brave little community.

After this slaughter, the Athenians, who had sent too late to counter-

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mand it, marched to Platæa and brought in provisions, and left a garrison in it, and took out the least efficient of the men with the women and children. These latter took up their abode for the time at Athens, and thus left their ill-fated native town free to sustain its memorable siege, which commenced within two years of this Theban attack.

Archidamus, King of Sparta, marched against Platæa, and having encamped his army, was about to ravage the surrounding fields, when the men of Platæa sent out envoys to him, who said: "Archidamus and Lacedæmonians, you are not doing what is right or worthy either of yourselves or of the fathers from whom you spring. For Pausanias, when he had liberated Greece from the Persian, after sacrificing in our Market Place to Zeus the Saviour, granted to the men of Platæa that they should live in independent possession of their land and town, and that no one should ever make war upon them unjustly, nor enslave them. These rewards your fathers gave us for the valour and chivalry which we displayed in those scenes of danger; but you are doing the very contrary, for in conjunction with the Thebans, our bitterest enemies, you are come to enslave us. We charge you not to harm Platæan soil, nor break the oath, but let us live independent, as Pausanias thought right to grant us."

After some unsuccessful negotiations, Archidamus delivered his final reply. "Do you then give up to us your city and houses, point out the boundaries of your territory, number your fruit-trees, and yourselves remove whithersoever you please, so long as the war may last. When the war is over we will restore your land to you. Until then, we will hold it in trust, cultivating it, and sending you such of the produce as will be sufficient for you."

The little community, although they saw no alternative to this proposal but utter destruction, would not accept it until they had communicated with their old friends the Athenians. When the Athenians heard of it they sent the following message: Men of Platæa, never in the past, since we became friends, have we on any occasion deserted you when in trouble, nor will we neglect you now. We charge you, by the oaths which your fathers swore, alter not the terms of our friendship." Upon hearing this message, the Platæans refused to treat with Archidamus, and the siege was immediately commenced.

The Platæan women and children and old men had, as we have seen, been removed to Athens, and the inhabitants of the little town were now reduced in number to 590. Of these, 400 formed the native garrison, and there were also 80 Athenians there, and 110 female slaves to do the cooking. The details of the siege are very fully given by Thucydides. There were palisades and counter-palisades, walls and counter-walls, mines and counter-mines; still the besieged force found means to baffle every move of the enemy. Then the Spartans brought up engines, huge battering rams, to play upon the city, and by means of them they broke down a considerable part of the walls, and at first greatly alarmed the Platæans. But these discovered an ingenious device for mastering the engines, dropping from the top of the wall great beams supported by

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iron chains, which they let fall with great impetus, and so broke off the head of the battering-ram, whenever it approached the wall. Then the Spartans had resource to fire. Waiting for a favourable wind, they built an enormous bonfire full of sulphur and pitch. "By these means," says Thucydides, "such a flame was raised as no one had ever yet seen produced by the hand of man." The fire very nearly destroyed the town, but the stars in their courses fought against the Spartans. A heavy rain and thunderstorm coming on quenched the flame, and so the danger ceased.

After this the invaders determined upon a blockade. They built round the town lofty walls of circumvallation, which we shall presently have occasion to describe, and having finished this work, "about the rising of Arcturus," that is, in the month of September, sat down and waited for famine to do its work.

After the Platæans had endured this blockade for more than a year, they became distressed by the failure of their provisions, and the non-arrival of help from Athens. But Athens had just now quite as much on her own hands as she could manage. With a desperate war raging abroad, and a still more deadly pestilence within her walls, she was quite unable to send any assistance to her faithful ally. However, the spirit of the Platæans was far from falling with their fortunes. They unanimously formed a desperate plan for breaking through the Spartan lines. Afterwards half of them held back from the enterprise, thinking the risk too great, but about 220 persevered. The story of the escape of these 220 Platæans, on a stormy winter's night of wind and rain, is one of the most picturesque chapters in the history of Thucydides. They made ladders to suit the height of the enemy's wall, by counting the number of bricks. The Spartans had built two walls, one against Platæa and one against an outside enemy, and between these two walls, which were 16ft. apart, were the soldiers' quarters, which were continuous, so that it appeared but one thick wall, with battlements and towers at certain intervals. The forlorn hope of the Platæans, on a wild December night of wind and sleet, secretly left their town and came up to the enemy's wall, unnoticed owing to the turbulence of the weather. They then placed their ladders against the wall at one of the spaces between the towers, knowing that these were deserted, a watch being always kept from the towers. A considerable number had climbed up on to the top of the wall before they were discovered, owing to one of them dislodging a tile with his foot. But in the darkness and the storm the sentinels were too bewildered to offer much resistance, and some of the Platæans taking possession of the two towers, held them while the rest effected their descent down the outer wall. As each man reached the bottom of the ladder, he turned to use bow and darts against the Spartans, who gathered on the walls to attack the two towers. When all were over those on the towers descended, the last with great difficulty.

That night all the precautions of the Spartans miscarried. They raised fire signals, which they hoped the Thebans, eight miles off, would

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see: but the Platæans who were left in the town raised other signals, in order to confuse these communications. The Spartans also sent out 300 men on the outside of their walls to cut off the Platæans, but, with incredible stupidity, gave them torches in order that they might find their way. Needless to say, the Platæans, themselves hidden by the darkness, found it easy, without suffering harm themselves, to discharge their arrows and darts towards the torches, and at the same time to avoid coming into contact with their bearers. Thus they were able to get clear over the moat, "though not without great difficulty, for ice had frozen over it, not strong enough to allow of their walking on it, but rather watery, as it usually is with a wind more east than north; and the night being somewhat snowy in consequence of such a wind, had swollen the water in it, which they crossed with their heads barely above it. But, at the same time, their escape was mainly effected through the violence of the storm."

After passing the moat, the Platæans took the road to Thebes, and not to Athens, in order to deceive the Spartans, whom they presently saw, as they expected, wandering in pursuit with torches along the road leading to the Oak Heads, in the direction of Athens. After going a mile or so towards Thebes, the Platæans turned off to the hills, and so came round to Athens, and of the 220 men who started, no less than 212 made their escape.

There were now only 200 Platæans left in the besieged town, with 25 Athenians and the female slaves, and with their numbers thus reduced, they were enabled to hold out until the summer. But starvation at length compelled them to surrender. The Spartans sent a message saying, that "if they would surrender their town voluntarily, and submit to the judgment of Sparta, she would punish the guilty, but no one contrary to justice." The famine-stricken garrison, to whom all terms were alike, surrendered, and the Spartans fed them for nine days, until five judges arrived from Sparta to try the case. The trial, if such it may be called, was a mere mockery. The Platæans were called forward and merely asked "Whether they had done any service to Sparta during the war!" This unexpected and cruel question dismayed the prisoners, who, requesting leave to speak, made a most eloquent and touching appeal to the Spartans, beseeching them by the tombs of their ancestors who fell on Platæan soil, by the promise of Pausanias, and by their own reputation for honour, not to condemn to slavery the land in which Greece won her freedom. But Platæa was doomed. A bitter indictment from the Thebans present was unnecessary to secure the condemnation of the men. Each of them was brought forward and asked the same question "Had he done Sparta any service?" Each of them answered "No," and each was led away to death. The town was razed to the ground, and the land let out to Theban landlords. "Such," says Thucydides, "was the end of Platæa, in the 93rd year of her friendship with Athens." The cruel and selfish conduct of Sparta requires no comment.

But though their city was in ruins and their lands given over to

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their oldest foe, the vitality of the Platæans was not yet exhausted. The 212 men who escaped during the siege, together with the inefficient population who had been previously removed to Athens, formed the nucleus of a Platæan settlement in that city, to whom, in the year 420, the Athenians offered the town of Scione, then vacant owing to the slaughter of its citizens. Thither the Platæan community repaired, until the proclamation of peace compelled them to return to Athens. And now the very men who had reduced them to this wandering life, took upon themselves the restoration of their city, for the dictates of Spartan policy pointed to the advantage of having the town rebuilt and occupied by a Spartan garrison, as an outpost against Thebes. The Platæans who had inter-married with Athenian women, removed with their wives and families to their ancestral home. In the year 376, when Sparta was excluded from Bœotia, Platæa was brought under the confederacy of which Thebes was the head. It was most unwillingly that she recognised her inability to oppose the supremacy of her powerful enemy; but she waited in hopes of the future, secretly endeavouring to persuade Athens to occupy the town and annex it to Attica. In the spring of the year 372, the Thebans became acquainted with these intrigues, and on a public holiday, when the Platæans were all in the country looking after their farms, the Thebans surprised and occupied the town. The inhabitants were allowed to depart, and to carry away their moveable property. Once more the town was razed to the ground. The Platæan fugitives repaired to Athens, where, seated as suppliants at the altar, in the place where their forefathers had sat some 150 years before, they moved the eloquence of Isocrates. But it was not until after the battle of Chæroneia in 338, that they were once more restored to their town, which was rebuilt by Philip. The new city continued to be inhabited for many centuries. At the present day the ancient walls may still be traced, two-and-half miles in circumference, but the town is no more. It is a good thing that its memorial has not perished with it; for surely there are few memories which more sweetly blossom in the dust than that of this great little city of Platæa.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

The Section has not met during the past Summer Quarter.

W. JACKSON, *Chairman.*

SECTION "C."

FOR GEOLOGY.

This Section has not met during the past quarter.

C. A. MOORE, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

June 15th.—The CHAIRMAN reported that at the Field-day on the 8th, five members went to Swannington Bog and collected a good many of the less common plants, among them *Scirpus pauciflorus* and *Eriophorum polystachion*, both recorded previously for this station, but for very few other places in the county. Also the fine moss *Hypnum commutatum*, which was found at this spot 40 years ago by Coleman and has never been again recorded in the county since that date.

Dr. FINCH exhibited three distinct forms of the purple lilac, and a number of other garden plants. Dr. COOPER, specimens of *Claytonia perfoliata* and *alsinifolia*, and of *Potentilla verna*, from Wales. Rev. T. A. PRESTON, *Asarum Asarabacca* in flower, and several abnormal cabbage leaves, some funnel-shaped, and one pair grown together along the mid-rib.

Mr. CARTER reported that Miss Kidger, of Ashby, had found *Vaccinium Vitis-Idæa* in flower on Charnwood Forest, a plant never yet recorded in this county.

Rev. T. A. PRESTON opened a discussion on the zero temperature of vegetation. He said it was now an accepted doctrine that about 42° Fahr. was the temperature below which vegetable growth could not take place; that as soon as the temperature rose above that point cell-formation

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began; that the amount of growth depended mainly upon the length of time during which a plant was exposed to such higher temperature, and the total number of degrees above 42 by which it was affected during that time; and that different plants required different numbers of such degrees to bring them to maturity. He was not himself quite satisfied with this theory. He had collected and recorded phenological observations for a long series of years, and he thought the theory would require some modification. The discussion was continued for some time.

Rev. T. A. PRESTON then read a short paper on "*Carduus tuberosus*, a rare British Thistle," which was illustrated by a number of dried specimens of this species and of its nearest allies, *C. pratensis* and *C. acaulis*. This thistle was only known to exist in England in the county of Wilts, and the early records of its appearance there were curiously inconsistent. It now grew at Avebury, and possibly in one or two other localities. Some supposed it to be a hybrid between *pratensis* and *acaulis*. It had the habit of the first, and the divided and serrated leaves of the second, but was distinguished by the fusiform tubers of the root.

A vote of thanks to Mr. MOTT, the retiring Chairman, was passed unanimously.

July 20th.—The CHAIRMAN, Dr. Tomkins, reported that four of the members had visited Stonesby and Saltby, situated on the strip of oolitic rock which occupies the north-eastern edge of the county.

The following rare plants were collected near Saltby, of which the first two were new to the county, and very interesting additions to its Flora: *Senecio campestris*, *Hippocrepis comosa*, *Cerastium arvense*, *Astragalus hypoglottis*. On the 13th instant four members visited Glen and Wistow, and collected good specimens of *Conium maculatum*, and of *Acorus Calamus* in flower.

Rev. T. A. PRESTON introduced a discussion on the best methods of teaching elementary science in public schools, with special reference to Natural History.

The CHAIRMAN read a paper on "The Active Principles of some British Poisonous Plants." Various specimens of these were shown in the fresh state, and the alkaloids and other active principles obtained from them were exhibited, with a brief account of the parts of the plants from which these were extracted. Their properties and physiological action were also referred to.

As usual, there was no meeting of the Section in the month of August.

HENRY TOMKINS, M.D., *Chairman.*

The Section has received the following Report from its Botanical Sub-Committee:—

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REPORT ON "THE FLORA OF LEICESTERSHIRE."

The Botanical Sub-Committee having completed the publication of "The Flora of Leicestershire," and the half-yearly statement of the London publishers having been received, we now present a full Statement of Receipts and Expenditure, and of the number of copies disposed of and still in hand.

THE FLORA OF LEICESTERSHIRE.

PUBLICATION ACCOUNT. MIDSUMMER, 1887.

Expenditure.

		£	s.	d.	£	s.	d.
Printing and Binding	COPIES (Gibbons) 300 ...	75	0	0			
Two coloured Maps	,, ...	10	10	0			
Extra proofs and fixing Maps	,, ...	7	6	0			
Binding 5 copies in morocco	,, ...	2	7	6			
,, 2 ,, in half-morocco	,, ...	0	12	0			
Packing, Posting and Delivering	,, ...	1	14	0			
Invoices, Envelopes, &c.	,, ...	0	6	6			
Total Printer's Bill					97	16	0
Advertising in five Local Papers ...		2	12	6			
,, in four London Papers, viz.: *Nature*, *Times*, *Athenæum*, *Journal of Botany*		3	2	0			
,, in *Midland Naturalist*		1	10	0			
Total for Advertising					7	4	6
Commission to Messrs. J. & T. Spencer ...					0	18	0
	300 ...				£105	18	6

Copies Disposed of and Cash Received.

	COPIES.		£	s.	d.
Subscribed for	...109 at 10/- ...		54	10	0
Damaged Copy sold	... 1 ,, 7/- ...		0	7	0
Sold by London Publishers, viz.:—Messrs Williams & Norgate	... 13 (net) ...		6	0	11
Presented gratis—					
Local Papers	5 ...				
Public Libraries	5 ...				
Sub-Committee	5 ...				
Nature	1 ...				
Athenæum	1 ...				
Journal of Botany	1 ...				
Midland Naturalist ...	1 ...				
Yorkshire Naturalist ...	1 ...				
Dr. Uhlworm, Cassel ...	1 ...				
Dr. Cooke, London ...	1 ...				
J. G. Baker, F.R.S., Kew...	1 ...				
Rev. H. P. Reader, Woodchester	1 ...				
John Roy, Aberdeen ...	1 ...				
W. Hackney, Hallaton ...	1 ...				
Miss Kidger, Ashby ...	1 ...				
W. Ingram, Belvoir ...	1 ...				
G. Robson, Leicester ...	1 ...	29			
To Society's own Library ...	...	2			
In hand in Leicester	...	131			
,, ,, London	...	15			
Present deficit, to cover which there are 146 Copies for Sale	...		45	0	7
		300	£105	18	6

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The work has been favourably reviewed in *Nature*, *The Athenæum*, *The Midland Naturalist*, *The Journal of Botany*, and all the Local Papers. Probably also in Dr. Uhlworm's German periodical *Botanischer Centralblatt*, which we have not had an opportunity of seeing.

Copies of the notices in *Nature*, *The Athenæum*, *The Leicester Journal*, and *The Leicester Daily Post*, accompany this Report.

The sale of the remainder of the Edition will probably be slow. We would suggest that copies should lie at all the principal booksellers on sale or return, in order to keep it before the public.

In the course of a few years it may be desirable to publish a short supplement, as new plants are still discovered in the county every year, especially among the lower cryptograms.

In one of the two copies which have been interleaved and bound for the Society's Library, the members of the Sub-Committee have entered in MS. the particular localities in which the rarer plants have been found. These were in many cases purposely omitted from the printed volume, but it is desirable that a permanent record of them should be kept in some place sufficiently public to be assessible to botanists.

From the various reviews of the work the Sub-Committee have obtained several useful suggestions, some of which might be carried out whenever a Supplement is published.

F. T. MOTT, *Chairman of the Sub-Committee.*

The Section having been desired by the Council to examine and describe the valuable collection of Algæ purchased from Mr. F. Bates, requested their late Chairman, Mr. F. T. Mott, to undertake this work, and his Report is appended:—

REPORT ON MR. F. BATES'S COLLECTION OF MICROSCOPIC SLIDES OF FRESH-WATER ALGÆ (purchased by the Society for £25).

The entire purchase comprises—

34 Boxes of Slides.
A bound Note Book.
A printed Catalogue (from "Flora of Leicestershire.")
A copy of Mr. Bates's paper on the Sexuality of Algæ.
Two manuscript Synoptical Tables.
A letter from Mr. John Roy, of Aberdeen.

The Boxes contain—

1353 Slides of Leicestershire Species.
196 Slides of British Species not yet found in Leicestershire.
12 Slides of Foreign Species.

1561
173 Slides of Desmids.

1734

Of the 1353 Slides illustrating Leicestershire Forms

1136 were collected in the county, mounted by Mr. Bates, and illustrate the 138 named Leicestershire Species in the printed Catalogue.
35 represent Leicestershire Species, collected elsewhere in Britain.
8 are Foreign Specimens of Species found also in Leicestershire.

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174 were collected in the county and mounted by Mr. Bates, but represent about 60 Species which he has not yet been able to name. It is believed that several of these will prove to be new.

1353

The 196 Slides of British Species not yet found in Leicestershire represent 105 Species.

The 12 Foreign Slides represent 19 Species.

The 173 Slides of Desmids represent 96 Leicestershire Species.

The total number of Species represented is—

138 Leicestershire, named.
60 ,, unnamed.
96 ,, Desmids.

294
105 British, not Leicestershire.
19 Foreign.

418

The 208 British and Foreign Slides were mostly purchased by Mr. Bates at 1/3 each.

The Boxes cost 5/- and 5/6 each.

The Note Book contains a mass of valuable notes, measurements, and memoranda, admirably arranged, and explaining many details respecting certain Slides which are carefully numbered and marked for reference.

The Desmids were named by Mr. Roy, of Aberdeen. The names are not given on the Slides, many of which contain from five to ten Species. But the Slides are grouped according to *localities*, and by reference to Mr. Roy's accompanying letter the Species may be traced.

Mr. Bates is now unable, from weakness of eyesight, to continue his investigations in this very interesting branch of Botanical Science, but the unique collection of Slides which he has got together will be invaluable to any future student, and among the 174 Slides of yet undetermined Species, there is work waiting to be done in a field which offers ample opportunity for new discoveries.

F. T. MOTT.

SECTION "E."

FOR ZOOLOGY.

June 11th.—Excursion to Glenn Hall and grounds on the invitation of Mr. T. WALKER.

A party of eight and two visitors accompanied Mr. WALKER from Leicester, and greatly enjoyed the ramble through the gardens and plantations surrounding the house. Several interesting captures were made, especially among the Diptera.

July 4th.—Mr. G. H. STORER read some notes on the parasite causing the "Gapes" in Poultry, &c. (*Syngamus trachealis*), giving a short account of the nature of the disease, the appearance and structure of the parasite, touching upon the most interesting points in its life history, and several methods of treating affected birds.

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The SECRETARY also read a short communication on the "*Sphingidæ*." After dealing with the chief characteristics of the family, and giving brief descriptions of the habits &c., of some of the typical species, a list of those recorded for the county by him, in which 10 out of the 16 British species were noted, was given in.

Mr. G. H. STORER exhibited original drawings of *Syngamus trachealis* made by himself to illustrate his paper.

The SECRETARY exhibited a typical collection of British *Sphingidæ*, including many local specimens, and microscopical preparations, to illustrate his paper, together with a transverse section of the injected tongue of a kitten, showing the position and structure of the papillæ with their capillary loops, and the arrangement of the muscular fibres, &c.

July 11th.—Excursion to Bradgate Park.

Seven members and two visitors left the town by brake at 2.30 p.m. A stay of about an hour was made at Groby Pool, but owing to the rather high wind and occasional showers, few specimens were collected. The eggs and young larvæ of *Galeruca nymphæa* were taken by Mr. H. E. QUILTER, on the leaves of *Polygonum amphibius*, where they live gregariously committing great ravages. A tree trunk near the pool yielded a fine newly-emerged specimen of *Notodonta camelina*, and many of the commoner Lepidoptera were present in profusion.

The weather having temporarily cleared on arrival at the Park, several hours were very pleasantly spent. Insects were by no means abundant. *Euchelia jacobææ*, *Acronycta aceris*, *Larentia pectinitaria*, *Abraxas ulmata*, *Tanagra chærophyllata*, and several other common species being the only ones taken among the Lepidoptera, while other orders were scarcely better represented.

August 8th.—Mr. G. H. STORER read a very interesting paper on "Newts and Salamanders." Their habits and most striking peculiarities were graphically described, and several noteworthy facts connected with the Toad and Tree Frog were also touched upon. A discussion followed, in which the CHAIRMAN and Mr. H. E. QUILTER took part.

OBJECTS EXHIBITED.

Tryphæna interjecta and other Moths, from Blaby, by the CHAIRMAN.

Pericallia syringaria, from Stoneygate, by Mr. B. HEADLEY.

Cherocampa elpenor from Dunkirk Street, and *Zeuzera æsculi* from the County, together with sections of injected tongue and kidney of Rat, the latter showing the vessels with the malpighian capsules and glomeruli, and the arrangement of the urinary tubules very clearly, by the SECRETARY.

September 5th.—Mr. H. E. QUILTER read a short paper on "The Hessian Fly in Leicestershire."

He stated that Leicestershire would appear to offer a good ground for its acclimatisation, as being a large corn growing district, and the soil

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of the south-western, and eastern parts of the county retaining a good deal of the moisture (this latter circumstance being specially favourable to the metamorphosis of the insect), great facilities were offered for its propagation. The following short and plain life history from a German author was given.

"*Cecidomyia destructor*, Say. (The Hessian Fly).

"The larvæ live in the haulm of wheat, rye, and barley. The female flies usually lay their eggs on the young leaves twice in the year, in May and September, out of which eggs the maggots hatch in fourteen days. These work themselves between the leaf sheath and the stem, and fix themselves near the three lowest joints, often near the root, and suck the juices of the stem, so, later on, the ear, which only produces small or few grains, falls down at a sharp angle. Six or eight maggots may be found together, which turn to pupæ in spring or about the end of July, from which the flies emerge in ten days."

The SECRETARY also read some notes on *Cristatella mucedo*, describing its appearance and structure, habits, and methods of reproduction.

OBJECTS EXHIBITED.

Tryphæna janthina, and various diptera, by the CHAIRMAN.

Pupa of *Cecidomyia destructor*, showing its position in the corn stalk, by Mr. H. E. QUILTER.

Rough-billed Tick-eater (*Crotophaga rugirostris*), by Mr. G. H. STORER.

Living specimen of *Cristatella mucedo*, from the Canal near Blaby, with sketches of its statoblast in different stages of development, by the Secretary.

W. A. VICE, *Chairman*

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Announcements.

GENERAL MEETINGS.

1887.

Oct. 10.—PRESIDENT'S Address.—"The Poetic Drama of the Present Reign."

,, 24.—Rev. E. ATKINS, B.Sc.—"The grained structure of Matter."

Nov. 7.—Sir ROBERT S. BALL, LL.D., F.R.S. (Astronomer Royal of Ireland).—"How Jupiter and Venus caused the Great Ice Age."

,, 21.—Rev. J. P. O. TOMKINS, B.A.—"Charles Lamb."

Dec. 5.—Professor SMITHELLS, B.Sc., F.C.S. (Yorkshire College, Leeds).—"The Elements."

,, 19.—W. SIMPSON, Junr., Esq.—"Ethical Instinct," a paper for discussion.

1888.

Jan. 9.—WILLIAM ARCHER, Esq.—"The Stage of the Future."

,, 23.—LEONARD COURTNEY, Esq., M.P.—"The Swarming of Men."
[This Lecture will be given in the Temperance Hall.]

Feb. 6.—AUGUSTINE BIRRELL, Esq.—"Samuel Richardson."

,, 20.—Rev. J. THEW.—"Cowper."

Mar. 5.—ANDREW LANG, Esq.—"Puss in Boots."

,, 19.—R. HARVEY, Esq., LL.B.—"A Philological Study."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. W. JACKSON, Loseby Lane.

Secretary—Mr. JOHN SCAMPTON, 1, Pelham Street.

The Meetings will be held in the Council Room, Town Museum, at 7 p.m., on the third Tuesday in each month, as under.

1887.

Tuesday, Oct. 18.—Mr. JACKSON.—"Introductory Address."

,, Nov. 15.—Mr. A. H. PAGET.—"The ending of some of Shakespeare's Tragedies."

,, Dec. 20.—Mr. CHAS. J. BILLSON, M.A.—"Letters from the Dead."

1888.

Tuesday, Jan. 17.—Mr. W. SIMPSON, Junr.—"Bimetalism."

,, Feb. 21.—Rev. A. P. DAWSON.—"W. S. Landor."

,, Mar. 20.—

W. JACKSON, *Chairman.*

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SECTION "C."

Chairman—C. A. MOORE, M.D., New Walk Gates.
Secretary—A. F. ATKINS, 124, London Road.

This Section meets on the second Thursday in each month at 7.30 p.m., in the Council Room, at the Town Museum.

C. A. MOORE, *Chairman.*

SECTION "D."

Chairman—HENRY TOMKINS, M.D., Fosse Road, Leicester.
Secretary—C. W. COOPER, M.B., King Street, Leicester.

EVENING MEETINGS.

The third Wednesday in each month, at 7 p.m., at the Museum.

Oct. 19.—Exhibition of Specimens.
Paper.
Subject for Discussion—"The possibility of greatly increasing the amount of vegetable food produced by the soil."

Nov. 16.—Exhibition of Specimens.
Paper.
Subject for Discussion—"Can Birds vary the colour and markings of their eggs?"

Dec. 14.—Exhibition of Specimens.
Paper.
Subject for Discussion—"Which is the most intelligent animal—the Dog, the Elephant, or the Monkey?"

HENRY TOMKINS, *Chairman.*

SECTION "E."

Chairman—W. A. VICE, M.B., 5, Belvoir Street.
Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

Oct. 3.—Paper by Mr. J. PALMER on "Bone."

Nov. 14.—Notes and exhibits by various members.

Dec. 12.—Paper by Mr. H. E. QUILTER on "The Physiology of a Freshwater Mussel," illustrated with dissected specimens, &c.

The paper of the evening will be read at 7.45; any business before the Section being then adjourned.

W. A. VICE, *Chairman.*

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TRANSACTIONS

OF THE

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PART VII., APRIL, 1888.

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F. T. MOTT, F.R.G.S.
W. N. REEVE, F.S.A.
GEORGE STEVENSON.

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T. CARTER, LL.B.	E. F. COOPER, F.L.S.
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E. CLEPHAN. T. C. LEE.

Four Co-optative Members of the Museum Committee of the Town Council, recommended by the Society.

H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.

Sections.

A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,
Chairman, WILLIAM JACKSON.
Secretary, JNO. SCAMPTON.

C. GEOLOGY,
Chairman, C. A. MOORE, M.D.
Secretary, A. F. ATKINS.

D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, H. TOMKINS, M.D.
Secretary, C. W. COOPER, M.B.

E. ZOOLOGY.
Chairman, W. A. VICE, M.B.
Secretary, F. R. ROWLEY.

Number of Members, 1887-8.

Subscribing 281, Associates 24, Honorary 21.—Total 326.

General Meetings.

Fortnightly, on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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Session 1887-88.

DECEMBER, 1887—MARCH, 1888.

GENERAL MEETINGS.

December 5th, 1887.—Professor Smithells, (Yorkshire College, Leeds), on "The Elements." (Professional.)

December 19th.—William Simpson, Junr., Esq., on "Ethical Instinct," a Paper for Discussion.

Mr. Simpson said the subject of his paper, "Ethics," or right and wrong conduct, had of late years been far too little considered by a society styled "philosophical." Having referred to the wonderful development of physical science during the present century, he remarked that it was important to turn to the discoveries in this field in order to find if possible a key to the solution of some of the great ethical problems. The attitude assumed by literary or philosophical students towards natural science should never be one of indifference. Even so ardent a champion of literature as Mr. Matthew Arnold admits that literature must embrace the results of science. What, then, could be said broadly to be the result of scientific inquiry during the past 50 years? The answer was undoubtedly "evolution," commonly called Darwinism; the theory, namely, that "the history of the universe may be described as a continual process of development." The bitter religious opposition and the general public repugnance at first manifested against that theory were fast disappearing. The theory, in short, assumed the operation in the world at large of the same laws which were found to operate with reference to individuals. Adopting that theory of evolution he proceeded to consider its bearing on ethics. He said he did not propose to discuss what was right or wrong or why it is so, but to confine his attention to tracing the origin of the moral sense or conscience, the faculty which distinguished between right and wrong. Did they find any indication of that moral sense in animals? Every observer must unhesitatingly answer "Yes." Could they find any trace of that moral sense common to animals and men. Was there any common instinct in which they could discover a possible clue to the problem? The old idea that man alone possessed mental and moral faculties, and that animals were led only by instinct, was now dying out. It was enough for them to bear in mind that instinct was not peculiar to the lower animals, but played a large and important part in the life of man. Could

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they find any instinct still existing amongst animals and men alike, so old as to be conterminous with the first existence of animal life and so widely spread as to be universal? It seemed to him that they found the true answer to the question in an instinct common to the whole animate world, and that was the instinct of self-preservation. In the earliest stages of animal life as well as in the infancy of an individual man that instinct was almost supreme, and developed into preservation of self and family. With the further progress of civilisation, other influences came into play, and the instinct of preservation slowly developed into the instinct of preservation of good name or self respect. That latter instinct, as it seemed to him, was the real foundation of morality. The exact mode in which that evolution had been effected could not of course be minutely traced. The instinct of self-preservation had by no means died out. It still prevailed among mankind whether savage or civilised, prompting that "struggle for existence" in which every human being took part. Yet the higher nature of man might be so developed as to become almost supreme over his lower or animal nature. Civilisation brought higher conceptions and standards of right and wrong, however lamentably any particular question might fall short of such standards in actual practice. The opposite doctrine was that man as distinct from other animals was originally endowed with a conscience intuitively and unerringly deciding for him what is right and wrong, but that doctrine seemed to him utterly irreconcilable with the simplest facts of history. The theory he was advocating simply assumed that the moral sense had been gradually developed, and attributed its origin to the universal instinct of self-preservation, and one of its chief recommendations was that it reconciled many other conflicting theories. In it the selfish and the unselfish theories of morality met. The highest form of ideal morality was absolute unselfishness. But a man entirely disregarding self would soon be reduced to destitution, and would cause selfishness in those whom he benefited. There was, however, a very remote chance of that ideal stage being attained. The self-preservation and self-regarding instincts were still too strongly and widely manifested to make such a state of things possible. Again, his theory was quite consistent with Comte's grand conception of humanity. Proceeding to anticipate one or two of the chief objections which he said he thought might be raised against the theory he had been supporting, he remarked that as regards the truth of it that was a matter not admitting of absolute proof one way or the other. Its probability alone had to be considered. Apart from the truth of the theory, however, the point upon which the strongest hostility might be expected was that the theory involved a low view of human nature by tracing the source of ethics to a purely selfish instinct. Precisely the same spirit of hostility was evinced against the evolution theory when applied by Darwin to the physical frame of man. Precisely the same answer held good with reference to the evolution of the moral sense or conscience as had been gradually admitted to be sufficient in the case of the evolution of man's body. Evolution carried with it no degradation, but, on the contrary, it

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implied a compliment to the human race. The theory did not in any way involve the idea that the conduct of men at the present time was prompted solely or chiefly by selfish motives, or by the instinct of self-preservation. Men's motives for their acts were now in this state of complex civilisation so mixed as to defy analysis. Conduct was often wholly or partially unconscious—the result of habit—still they might consistently with that theory attribute a fair amount of conduct to purely good and unselfish motives. As with the bodily senses of man, so with the moral sense. The degree of developement varied widely in different races and in different individuals. What was once low and degraded became by evolution lofty and sensitive, until the trace of its baser origin was lost. In conclusion, Mr. SIMPSON said the theory he had ventured to propound traced the origin of all morality to the instinct of self-preservation. If his arguments did not induce his hearers to accept that theory in its entirety, enough perhaps had been said to indicate the probability of the view that that universal instinct had exercised and still continued to exercise an important influence on ethics.

A long discussion upon the lecture then ensued, in which the Rev. PAGE HOPPS, Messrs. MOTT, GRANT, HARVEY, and PLANT, and Aldermen KEMPSON and STEVENSON took part, and their various objections were replied to by Mr. SIMPSON.

January 9th, 1888.—WILLIAM ARCHER, Esq., on "The Stage of the Future." (Professional).

January 23rd.—LEONARD COURTNEY, Esq., M.P., on "The Swarming of Men." (This Paper has been published in the "Nineteenth Century" Review for March, 1888).

February 6th.—AUGUSTINE BIRRELL, Esq., on "Samuel Richardson." (Professional).

February 20th.—Rev. J. THEW, on "Cowper."

Mr. THEW remarked that whatever Cowper might have been to a past generation he was by no means the popular poet of this. Except that he was the author of "John Gilpin," wrote a few hymns at Olney, and had a most serious habit of going mad—what did the present generation know of Cowper? The popular idea of the uninitiated was that Wm. Cowper was a man by courtesy more than anything else called a poet, who lived at Olney, was very eccentric, wrote some harmless poems, and wore a nightcap. Much of that was correct—the nightcap for instance, or what looked alarmingly like one. It was really a dress-cap, the work and gift of his cousin Lady Hesketh. That he wrote harmless poetry—by which was meant, of course, poor stuff—was also true. Parts even of his greatest work, "The Task," not to mention other of his productions, were only dreary reading, while some of his hymns—he (the

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lecturer) hoped it would be no offence to say—were very weak in expression, and had yet more serious faults still. In a matter of that kind, however, it was only fair to remember that Cowper did not stand alone. William Cowper, properly "Cooper," was born at Great Berkhampstead in 1731. His father was vicar of the parish, and his mother was descended from a family of poetic notoriety. The event of his childhood and of his life was the loss of his mother. She died when he was six years old, and whatever woman's affection did for him in after life—and it did all that it could—Cowper was only a motherless child to the end of his days, and that probably was the pathetic secret of his life. The lines written in long later years upon the receipt of his mother's picture—who did not know them? and was there ever such a wail made articulate in human speech? If they looked through the loophole of those lines they might see the kind of child, and, alas! the kind of man, Cowper was, for in this case the saying was strictly true that the child was the father of the man. Of the qualities which fitted for the rough work of life he was absolutely destitute. Of the more common qualities, without which life could hardly get itself lived at all—self-reliance, governing power—he seemed by nature to have as little. It were wrong to think of him as a kind of bashful man, for that would imply that he was silly, and though he was sometimes mad he was never silly. It were wrong to think of him after any of the ordinary types of the unmanly man, for some part of his poetry was as strong and healthy as any poet had ever given them. He seemed to have come into the world and to have lived his life in it resembling more a scared spirit than anything else, though so far as outward appearances were concerned he was not physically ghostlike. He was a man of middle height, or rather above it. He was strongly-built, with large thick limbs. He had beautiful light brown wavy hair, and, except during the terrible visitations to which he was constantly liable, he was of a healthy and even of a ruddy complexion. No such covering, however, enclosed the inner man. A trembling mass of quivering sensibilities—timid as the hares that he tamed, to the end of his long life glad to turn round a corner or to cross a field or to do anything else to avoid meeting with a friend. He invited persons to his house, and dared not meet them. He was anxious for their society, he was brilliant when he could screw his courage to the sticking place, but he was by no means sure till the last moment that he could dare to face them in the flesh. He was never able to rise above a scared condition. He was always frightened, he was always hurrying from something—the face of man or the edict of God; but clearly indicated in some of his pictures, in which madness was apparent. If any were disposed to despise as a miserable weakling that man, he might remind them that that was the man who revolutionized their modern English poetry, and introduced to this country a new era of intellectual and poetical life. Having briefly reviewed the poet's school life, and referred to some of the celebrated school-fellows he had, the lecturer remarked that it was his association with his three beautiful cousins in London which made his poetry

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essentially manly and rational in tone. His poetry was never mad, and his feeling, or description, or sentiment never ran away with him. Much of that was due to his unfailing humour. He was a hearty laugher, which was always a sign of health. When he wrote "John Gilpin," which was said to have given as much pleasure to as many people as anything of the same length ever written, he lay awake all night laughing at it. His letters, when he could forget himself and drop the tone which Newton and disease seem to have imposed upon him, were full of fun and brimming over with frolic. It was not possible, however, with candour to speak highly of Cowper's early days. Up to thirty years of age his life and philosophy of life were not of a very high order. His condition at this period the lecturer described as one of lazy quiescence, and attributed it in part to his natural temperament. He never could act. He was not really lazy, but at that period of his life he was wanting in vitality. They could not be too thankful for the tragic event which came like a bolt and put an end to the kind of life he was then living. Having commented on the circumstances under which Cowper endeavoured to commit suicide and the state in which that event left him, Mr. Thew said there was no exaggeration in saying that he never really escaped, after that painful episode, from the terrible conviction that he was damned. Whatever they might think of Cowper's religion or that sect to which he belonged, it was not his religion that drove him mad. His connection with Newton was not healthy, his connection with the whole movement of which Newton was so prominent a figure was not an unmixed good. Yet, so far as madness was concerned, all they were entitled to say was that it took a religious turn. Speaking of Cowper's life at Huntingdon, he remarked that if there was any period of his life in which it might be said that he was happy, it was during the next seven or eight years after his settlement there. Newton's influence over Cowper after the death of Mr. Unwin was tyrannical. Heated religious meetings, no rest, unstrung nerves—and he went mad again and avenged the tyranny of Newton's influence by going mad in his house, and resolutely refusing to quit it for sixteen months, during the whole of which time he had the untiring and watchful attention of Mary Unwin. It was on emerging from that attack that Cowper achieved his historic triumph over the brute creation, which went far to show that man's dominion need not break nature's social union. He, the timidest and shyest of men, tamed three of the shyest and timidest wild animals. Who had not heard of Cowper's historic hares? Returning to his writings, the lecturer said that at fifty years of age Cowper was the author of a few fugitive verses, not one of which gave any idea of his poetic genius. He had up to that time written nothing that would live, and it was only at the request of Mrs. Unwin that he attempted anything more. He always wanted prompting. His first published volume, taken as a whole, lacked almost everything that "The Task" possessed. But suddenly, like springs in the desert, the unsuspected fount of poetry gushed forth. This time he was prompted by Lady Austin. Out of a subject as

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unpoetic as a sofa, there grew a poem which inaugurated a new school of poetry. "The Task" simply turned out the old artificial school of poetry. It called men back again to simplicity and nature. He (the lecturer) though it made Wordsworth possible to this generation. It took them back to simplicity and fact. It glorified the simplest scenes in nature and the simplest incidents of human life, and it breathed throughout such a love of man, and a universal freedom, as was new in the poetry of his days. Its sketches of domestic life had never been surpassed, and as for descriptive power it was photographic. The poet's last days were dark and dreadful enough. Mind and body gave way, and the terrible fancy again took hold of him that he was damned below Judas.

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THE CAUSE AND THE LIMITS OF ORGANIC GROWTH.

By F. T. Mott, F.R.G.S. (Read before Section "D," *Feb. 15th, 1888.*)

In the perpetual evolution of natural objects there are three distinct methods of growth known to us. These are—

1. Simple external accumulation, as the heaping up of a sandhill by the wind, and the growth of a planet by meteoric additions.
2. Selective external accumulation, as in the growth of a crystal, which increases externally but not promiscuously, having some unexplained power of selection from surrounding ingredients.
3. Selective internal accumulation, or the assimilation of food, which is an especial characteristic of organic life; surrounding substances being absorbed into the interior of the body, certain selected ingredients there separated, often chemically altered, and finally assimilated with the existing tissues, while the unselected material is excreted.

The special characters of organic growth, as distinguished from either of the others are therefore that it is *internal*, and that the material is *assimilated*, not merely accumulated.

But there is yet another character still more remarkable and suggestive. Organic growth is always *limited*. There is no necessary limit to the heaping up of a sandhill or the growth of a planet or even of a crystal, but every organism has a definite limitation of size and form beyond which it cannot extend itself. Surrounding conditions may alter the limit within a certain range, but can never expunge or destroy it.

A unicellular alga surrounded by abundant food and ideal conditions of temperature and light may swell to two or three times its average size, but it will finally granulate and break up, and the spores, or young cells will begin the same process again. In the same way a tree, an oyster, a bird or a man has each a limit,—in some unknown manner *pre-ordained*,—a limit with a certain amount of elasticity, and yet quite absolute and impassable. The elasticity is indeed often considerable. Plants which are mere herbs in northern climates may be shrubs of some size in the south. On our own Charnwood hills *Senecio sylvaticus* may be found in flower scarcely three inches high, while in the richer valleys it will reach three feet. But whatever may be its size, it has got to produce its flower and then die, and this it will inevitably do.

Why should an organism be thus limited while a crystal is not so? It is evident that in both there is some intrinsic force which not only attracts the material for growth, but selects certain ingredients in

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preference to others. In this they resemble each other, but while a crystal may increase indefinitely, and single crystals have been found weighing several tons, an organism has a climacteric which is fixed within a certain range, and beyond which its growth cannot be continued.

It is remarkable that as there are three possible methods of growth, so there are also three forms of wave motion in nature. These are—

1. The simple wave of oscillation.
2. The compound wave of undulation, consisting of many oscillations moving divergently from a definite point, and therefore centrifugal.
3. The compound wave of concentration, consisting of many oscillations moving convergently towards a definite point, and therefore centripetal.

If the three methods of growth are caused or controlled by these three forms of wave motion their peculiar characters may be explained.

The simple oscillation is a mere heaping up of force, anywhere, accidentally or promiscuously, that is, under the influence of some law which is extrinsic not intrinsic, and represents the growth of a sandhill or a planet.

The centrifugal wave of undulation represents precisely the more complex and regular but indefinite growth of a crystal, which originates at a definite point and increases outwardly as long as suitable material is found, the laminated nature of crystalline growth indicating that the advance is by a series of successive oscillations.

Finally, the centripetal wave of concentration represents with equal precision the complex, definite, and limited growth of an organism, by internal assimilation and constant increase of complexity and vital energy up to a certain point or climax, when reaction and dissipation supervene.

Nearly everything in the universe, as far as it is known to us, is either growing or decaying. It may well be doubted whether there is such a thing as absolute rest, absolute equilibrium, absolute stability. If heat is molecular motion, there can be no quiescence except at the absolute zero, and where is this to be found?

But if every object is more or less heated, and unequally heated, there must be a perpetual interchange of heat by radiation, convection, and conduction. This implies a continual increase and decrease of bulk, and by friction and evaporation a continual interchange of the heaping up and dispersion of matter. Hence arise the great slow secular oscillations by which star-systems and planetary systems are brought into existence, and probably in the flight of ages disappear again. Among such universal oscillations of force it is certain that many complex arrangements must arise, especially the centrifugal wave of undulation with its expanding spheres of rythmic oscillations, and at a later stage of complexity the centripetal wave of concentration, which like a vortex continually draws to itself surrounding waves of less intensity, until a maximum of concentration is attained. In this manner would be originated first the

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indefinite crystalline life, and then the definite organic life: and thus from the nature of its cause every organism must have a limit which it cannot pass.

This limitation, this inevitable succession of concentration and dispersion, of growth and decay, is characteristic of organic life in all its phases. In the mechanical world, and in the crystalline world, growth and decay are indefinite and more or less irregular, they are not dependent upon the intrinsic law of growth. But in the organic world they are the necessary consequence of that intrinsic law and constitute a perfectly distinguishing character. Every individual organism begins its existence as a single cell, increases in complexity as its life continues, reaches maturity, dies and is dissipated. Every species passes through a similar history, so also does each genus, each order, each class, and perhaps in some epoch yet to come, it will be seen that the whole organic world itself existed under the same law, and, having reached its climacteric, went out and was no more known save as a fossil relic in a forgotten universe.

That each organism and each organic group is a centre of accumulating force, a vortex into which inorganic force is continually drawn and assimilated to the organic type, so that while the individual or the group increases in bulk it increases still more rapidly in complexity and in active energy,—this is a theory which rationally accounts for the phenomena of organic life and growth. It gives a meaning to food, the prime element of organic existence; it explains the life history of plants and animals as advancing always from the simple to the complex, attaining a climax at which the energies of life are at their utmost intensity, and thence receding through corresponding stages to death and dissipation. Finally it supplies an explanation of the gradual development of organic beauty, that wonderful signature which marks the maturity of every centripetal wave, indicating by its degrees of intensity the rank and perfectness of the organism. For the recognition of beauty depends upon the perception of unity among a number of differences. The very limited range of human perceptivity can only recognize that unity where the differences are small. In the concentrating force-wave the differences of the accumulated waves grow continually less as they are drawn to the centre, and thus the beauty which was always there becomes visible to human sense, chiefly about the time and place of greatest concentration. Beauty is thus shown to be naturally and necessarily the measure of maturity, as it assuredly is throughout the organic world, where in every group the richest beauty marks the highest organization, and where in every individual a special beauty is developed with the maturity of each of the principal tissues corresponding to the stages of life.

We may therefore state the *cause* of organic growth to be the operation in nature of the centripetal force-wave, and the limits of such growth to be dependent partly on the initial intensity of the wave, and partly on the food material which it is able to accumulate.

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I have treated this subject from a purely physical point of view. I have not attempted to go into the still deeper questions of the relation between force and matter,—the origin of motion, or the meaning of attraction. In my judgment, this purely physical treatment must necessarily be superficial and inadequate. I do not think we can properly understand the physical universe except in conjunction with metaphysical thought. I think that recent materialistic science is mistaken in its rejection of metaphysics, and that the next great step forward will be in the direction of an equal outlook from both sides, a sympathetic combination between abstract thought and concrete experiment, a movement which has indeed already begun.

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LAND AND FRESH-WATER MOLLUSCA, COLLECTED IN LEICESTERSHIRE DURING 1885-86-87.

By H. E. Quilter, M.C.S. (Read before Section "E.")

The County of Leicester appears to be so situated as to make it an interesting district with regard to Land and Fresh-water Mollusca. Being centrally situated, those species absent in the more northern counties may very probably be found here, while those which are generally regarded as South of England forms may also be present.

The drainage system of the County is so extensive and varied that it affords many suitable environments for the Fresh-water Mollusca, while the geological formations afford areas upon which the Land Mollusca may find suitable habitats. There can be no doubt that the latter case will prove true. The following list does not claim, on this ground, to be a complete one, as I have not yet investigated the Carboniferous Limestone district of the County, nor the Middle Lias Marlstone and Oolite districts forming the eastern boundary of the County. These, I fully expect, will, from the favourable conditions developed there, considerably augment the number.

Summarizing the list, it stands as follows:—

Fresh-water shells	-	-	34 species and	14	varieties.
Slugs - - - - -			7 „	4	„
Land shells - - -			22 „	9	„
Total	-	-	63 species and	27	varieties.

Spherium corneum, *L.* Very common in ponds, streams and the Canal; very abundant at Saddington Reservoir.

S. corneum, var: *flavescens*, *Macgill.* Canal, Wistow Park.

S. rivicola, *Leach.* River Soar, Mountsorrel; Canal, near Blaby.

S. lacustre, *Müll.* Small specimens in pond, Stable Quarry, Bradgate Park.

S. lacustre, var: *brochoniana*, *Bourg.* Saddington Reservoir.

Pisidium amnicum, *Müll.* A few single valves found in Saddington Reservoir, and Brook, Ratby.

P. fontinale, *Drap.* Common, Saddington Reservoir.

P. fontinale, var: *henslowana*, *Sheppard.* Not uncommon, Saddington Reservoir.

P. pusillum, *Gmel.* Numerous in pond, Stable Quarry, Bradgate Park.

Unio tumidus, *Phil.* Plentiful in Groby Pool.

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U. TUMIDUS, var: *ovalis, Mont.* One specimen in brook, near Ratby.

U. TUMIDUS, var: *ponderosa, Pascal.* Fish-pond, Wistow Hall. This variety was described by M. Pascal, in 1873, in his "Catalogue of Land and Fresh-water Shells of the Haute Loire and Environs of Paris." Referring to this variety, he says: "Coquille plus grande, et plus épaisse." Upon submitting specimens from the above locality to Mr. J. W. Taylor, of Leeds, he pronounced them to be the variety *ponderosa* of Pascal, and added: "This variety has not, I believe, been published as British." The large size and thickness of the specimens from this locality is very probably due to a suitable environment, which has influenced the selective working of their tissues to so great an extent that they are able to manufacture a large heavy shell. The amount of carbonate of lime present in the water is 15·2 grains per gallon. This is no doubt derived from the Lower Lias clays, through which the stream supplying the pond flows.

U. PICTORUM *L.* One specimen, fish-pond, Wistow; common at Groby Pool. The nacre or pearl of some of the specimens from Groby Pool was salmon-coloured, or tinted. This I found to be caused by the presence of oxide of iron, derived from the Red Marls of the Trias formation, which were exposed at one side of the Pool. It may be added that the salmon-tinged specimens were confined to this part of the Pool.

ANODONTA CYGNEA, *L.* Common in fish-pond, Wistow, and Groby Pool.

A. CYGNEA, var: *zellensis, Gmel.* Very fine specimens from the fish-pond, Wistow; smaller in Groby Pool.

A. CYGNEA, var: *pallida.* Uncommon, fish-pond, Wistow.

A. ANATINA, *L.* Common in Groby Pool.

DREISSENA POLYMORPHA, *Pall.* Common at bottom of submerged walls of bridges in Canal, and on piles, &c., River Soar.

NERITINA FLUVIATILIS, *L.* Common on submerged walls in Canal. While sweeping nettles for *Succinia*, &c., by stream, Bradgate Park, during the summer of 1887, I found a live specimen of this Mollusc in the net.

PALUDINA CONTECTA, *Mill.* This is common at the end, nearest the Canal, of the feeder from Saddington Reservoir.

P. VIVIPARA, *L.* Common in Canal, near Wistow Park.

BYTHINIA TENTACULATA, *L.* Very common in Groby Pool; Saddington Reservoir; Canal, Aylestone.

B. TENTACULATA, var: *zonata.* Two specimens of this variety were found in Groby Pool. They have a white band below the periphery of the last whorl.

VALVATA PISCINALIS, *Müll.* Abundant at Saddington; Groby Pool. Common in streams and Canal. Very fine and large specimens in stream, Great Glenn. Some of the specimens from Saddington had the last whorl dislocated.

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V. PISCINALIS, var: *subcylindrica.* Saddington Reservoir, and brook, near Ratby.

PLANORBIS NITIDUS, *Müll.* Groby Pool; pond, Stable Quarry, Bradgate Park.

P. NAUTILEUS, *L.* Groby Pool.

P. ALBUS, *Müll.* Groby Pool; Saddington Reservoir.

P. SPIRORBIS, *Müll.* Common, but local, Anstey Lane and The Groves. Generally found among the duckweed (*Lemna minor*, L.) on the surface of ponds.

P. VORTEX, *L.* Ponds, near Anstey, and The Groves; Groby Pool; Saddington, &c.

P. CARINATUS, *Müll.* The most abundant species in ponds, &c.

P. CARINATUS, var: *disciformis, Jeff.* Saddington Reservoir.

P. COMPLANATUS, *L.* A few specimens in large roadside pond, near Barrow-on-Soar.

P. CORNEUS, *L.* Fish-pond, Wistow Hall.

P. CONTORTUS, *L.* Canal backwaters, Aylestone.

PHYSA HYPNORUM, *L.* Ditch, near Birstall.

P. FONTINALIS, *L.* Stream, near Hinckley; Loughborough; Canal backwaters, Aylestone.

P. FONTINALIS, var: *curta, Jeff.* Saddington Reservoir, and Canal backwaters, Aylestone.

LYMNEA PEREGRA, *Müll.* This variable species is common in almost every pond or piece of water in the County.

L. PEREGRA, var: *ovata, Drap.* Pond, The Groves; Wistow fish-pond; stream, Bradgate Park.

L. AURICULARIA, *L.* Groby Pool; Saddington Reservoir; Canal, Aylestone and Wistow.

L. STAGNALIS, *L.* Very fine specimens in pond at Beaumont Leys. Pond, Burbage Wood; Wistow; Saddington; Barrow-on-Soar.

L. PALUSTRIS, *Müll.* A few specimens from Canal backwaters, Aylestone.

L. TRUNCATULA, *Müll.* Small specimens in stream, Sheet Hedges Wood. Pond, Old John Hill, Bradgate Park. This is a very curious species, sometimes found on land. I have found several at roots of grass, near Evington, associated with land shells.

ANCYLUS FLUVIATILIS, *Müll.* On stones in stream, Bradgate Park; Canal, Aylestone.

A. LACUSTRIS, *L.* Canal, Wistow Park; uncommon.

A. LACUSTRIS, var: *albida, Jeff.* Not common, Groby Pool.

ARION ATER, *L.* Common everywhere in country. This black slug is well known from its general appearance either before or during rainy weather. A very variable slug in colour.

A. ATER, var: *brunnea.* This chocolate-coloured variety I found on the slopes of Old John Hill, Bradgate Park.

A. HORTENSIS, *Fer.* Very common in gardens in the Town of Leicester; also at Freemen's Gardens, near Aylestone. They only appear to show themselves under certain hygrometric conditions.

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AMALIA MARGINATA, *Müll.* Not common. A few specimens found crawling near gardens in Town of Leicester.

LIMAX MAXIMUS, *L.* Embankment by canal-side, Belgrave; New Parks, near Leicester; and common in cellars in Town.

L. MAXIMUS, var: *fasciata.* Sometimes found in cellars. A specimen of this variety, from Belvoir Gardens, was a gigantic example, measuring, when outstretched, eight inches in length.

L. MAXIMUS, var: *cellaria.* Lime Quarries, Barrow-on-Soar; Quarries, Mountsorrel; Evington; near Wigston.

L. FLAVUS, *L.* Common in cellars of houses in Town.

L. AGRESTIS, *L.* This field-slug is the plague of gardeners. Common also in fields.

L. AGRESTIS, var: *sylvatica.* Common with type.

TESTACELLA SCUTULUM, *Sow.* Through the kindness of W. Ingram, Esq., of Belvoir Gardens, I am able to record this interesting snail-slug for Leicestershire. The specimens were found nearly 18 inches underground, hybernating, during the removal of some masses of rock forming part of a waterfall in the Gardens of Belvoir Castle, January, 1888. These snail-slugs are carnivorous and very voracious, earth-worms being their chief food. They will, however, eat centipedes, as Mr. Ingram has seen them do so.

SUCCINEA PUTRIS, *L.* Found on nettles by stream-side, Bradgate; near Groby; and Saddington. Under stones in damp places, Wistow Park.

S. ELEGANS, *Risso.* On nettles, stream-side, Sheet Hedges Wood; stream, near Birstal.

VITRINA PELLUCIDA, *Müll.* Kirby Fields; hedge-bottom, Birstal; and Lime Quarry, Evington.

ZONITES CELLARIUS, *Müll.* Common, ruins, Bradgate; near Anstey; Tilton-on-the-Hill; and Kirby Muxloe.

Z. GLABER, *Stud.* A young specimen found near Anstey.

Z. NITIDULUS, *Drap.* Common round ruins, Bradgate Park; Kirby Muxloe; hedge-bottom, Birstal; Tilton-on-the-Hill.

Z. NITIDUS, *Müll.* By side of Canal feeder, Saddington.

Z. CRYSTALLINUS, *Müll.* Bradgate Park; Aylestone Meadows; Birstal. Not common.

HELIX ASPERSA, *Müll.* Common around Leicester in gardens, and in ruins, Bradgate Park.

H. ASPERSA, var: *undulata.* Bradgate Park.

H. ASPERSA, var: *albo-fasciata.* A young specimen, Dane Hills.

H. NEMORALIS, *L.* The type is abundant, especially in limestone districts.

H. NEMORALIS, var: *libellula, Risso.* Occurs with type commonly. I have met with the following band variations:—12345, 1(23)45, (123)45, (123)(45), 12300, 123(45), (12345), 00100, 00000.

H. NEMORALIS, var: *rubella, Moq.* Also occurs with type, with band variations:—12345, 02345, 023(45), 12000, 00100, 00000.

H. NEMORALIS, var: *bimarginata, Moq.* Not uncommon with type.

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H. CONCINNA, *Jeff.* Not common, Bradgate Park.
H. HISPIDA, *L.* Very common and widely distributed.
H. HISPIDA, var: *albida*, *Jeff.* Ruins, Bradgate Park.
H. HISPIDA, var: *subrufa*. *Moq.* Occurs with type, Barrow-on-Soar; Wistow Park; ruins, Kirby Muxloe.
H. VIRGATA, *Da Costa.* In old Ironstone Quarry, Tilton-on-the-Hill.
H. CAPERATA, *Mont.* Near Railway, Loughborough.
H. ERICETORUM, *Müll.* Abundant, Lime Quarries, Barrow-on-Soar, and Evington.
H. ERICETORUM, var: *alba*, *Charp.* With type, Barrow-on-Soar.
H. ROTUNDATA, *Müll.* Common almost everywhere.
H. PULCHELLA, *Müll.* Common around ruins, Bradgate Park. Under stones, near Evington.
H. PULCHELLA, var: *costata*, *Müll.* Bradgate Park.
BULIMUS OBSCURUS, *Müller.* Under pieces of ironstone, &c., in old quarry, near Tilton-on-the-Hill.
PUPA UMBILICATA, *Drap.* At roots of grass, not common, near Evington.
VERTIGO PYGMEA, *Drap.* Commoner than the preceding in same situation.
CLAUSILIA RUGOSA, *Drap.* Common round ruins, Bradgate Park; hedge-bottom, Anstey. Sometimes found under bark of willow trees in winter, Evington.
COCHLICOPA LUBRICA, *Müll.* Bradgate Park; Birstal; Saddington; and in old Ironstone Quarry, Tilton-on-the-Hill.

The more difficult species and varieties have been verified for me by the recorders of the Conchological Society, Messrs. J. W. Taylor and W. Denison Roebuck, of Leeds.

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LETTERS FROM THE DEAD.

By Charles J. Billson, M.A. (Read before Section "A.")

The title of this paper has a certain gleam of sepulchral phosphorescence of which I would fain have it innocent. It suggests some morbid and sensational theme. It reminds one of those dreadful "Letters from Hell" which the imprimatur of George Macdonald has lately smuggled on to so many respectable shelves. Let me say at once that, in choosing the subject of this paper, I had no thought of any such ghostly communications from the Silent Land. Neither was I thinking of any of those intimations from departed spirits which are now engaging the research of Mr. Myers and Mr. Gurney, the mysteries of thought reading and telepathy, the missives of Planchette, or those strange foreign telegrams which the operator reads off from the tickings of a table. No, the "Letters from the Dead" which I have in my mind are of another and a less exciting description. They were written by persons actually alive, and it is merely the subsequent death of their writers which prevents my title from being a misnomer. In truth, I was led to the choice of so ambiguous a heading by thoughts which were suggested by a saying of Dr. Johnson. Among the gloomy apprehensions which embittered the last illness of that good man, the idea occurred to him that, when he lay in the grave, he would never receive any letters. He chanced, as I thought, upon a quaint but forcible instance of the one-sidedness which inevitably marks all relation between the living and the dead. To them we can give no gift, we can send no message; in no way can we help them from our vital store.

"A gate of adamant has barred the way."

On the other hand, it is from what Homer calls the *νεκύων ἀμενῆνα κάρηνὰ*—"the strengthless heads of the dead"—that the living receive more than half their strength. So in this particular instance, while it is true that the dead receive no letters from the living, there is a countervailing cheerfulness in the thought that the living receive almost all their best correspondence from the dead. And hence it seemed to me that one might do worse than consider how great a debt we owe to those who have gone before us for the letters which they have left behind them.

I think it was Crabb Robinson who used to say that when a new book was published he read an old one. In the same way, it is not a bad plan, when you hear the postman's ring, to take down a volume of old letters. No breakfast table is complete without a good letter, and if living correspondents are dull or troublesome, it is easy to checkmate them, and to secure a more gracious opening for the day, by turning to

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some of the many excellent letters which have been written by the touch of vanished hands, and which, moreover, were never meant to be read by us. Perhaps that is half the secret of their charm. It is so much nicer to read other people's letters than one's own.

The characteristics of a good letter have been well sketched in an epistle of James Howell, which will form a good introduction to our subject, and may help us to a way of treating it. It runs as follows:—

"Westminster,
"July 25, 1625.

"Sir,—It was a quaint difference the ancients did put betwix a letter and an oration; that the one should be attired like a woman, the other like a man: the latter of the two is allowed large side robes, as long periods, parentheses, similes, examples, and other parts of rhetorical flourishes; but a letter or epistle should be short coated and closely couched; a hungerlin becomes a letter more handsomely than a gown; indeed we should write as we speak, and that's a true familiar letter which expresseth one's mind, as if he were discoursing with the party to whom he writes, in succint and short terms. The tongue and the pen are both of them interpreters of the mind; but I hold the pen to be the more faithful of the two. The tongue, *in udo posita*, being seated in a moist slippery place, may fail and falter in her sudden extemporal expressions; but the pen having a greater advantage of premeditation is not so subject to error, and leaves things behind it upon firm and authentic record.

"Now letters, though they be capable of any subject, yet commonly they are either narratory, objurgatory, consolatory, monitory, or congratulatory. The first consists of relations, the second of reprehensions, the third of comfort, the two last of counsel and joy; there are some who in lieu of letters write homilies; they preach when they should epistolize: there are others that turn them to tedious tractates; this is to make letters degenerate from their true nature."

Omitting, then, the tractates and homilies, we have five kinds of letters catalogued by Howell. I do not know how he would class love letters: perhaps he would say that they are either congratulatory or objurgatory. However, there is another kind of letter, of growing importance, which he has certainly omitted—the precatory, or begging letter. If we make a separate class of love letters and add the begging letter, we have these seven categories of correspondence:—

1. Amatory.
2. Precatory.
3. Narratory.
4. Objurgatory.
5. Monitory.
6. Congratulatory.
7. Consolatory.

Of course the business letter is not counted, because that is nothing more than a temporary convenience, and has no concern with literature any more than doctors' prescriptions or Christmas bills. But even a business letter may almost rise to the dignity of literature upon occasion. Here, for instance, is a letter from Captain Walton to Sir George Byng, which is an ideal business letter, and yet by that very fact has such a suggestion of heroism in it, that it is almost something more. Captain Walton had taken four Spanish men-of-war, with a bomb-vessel and a ship laden with arms; and had also burnt four men-of-war, with a fire-ship and a bomb-vessel. This was a great thing to do, but his report to his Admiral is perhaps greater. He writes:—

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"Sir,—We have taken and destroyed all the Spanish ships and vessels which were on the Coast, the number as per margin.—Yours, &c.,

"G. WALTON."

"Canterbury off Syracusa,
"Aug. 16, 1718."

Now, let us try to find a few specimens of good letters, according to our categories; and first of amatory letters.

I.—AMATORY.

I have chosen two love letters, both very charming and very brief, out of the unmeasured continent of hay in which they are embedded. The first is a letter—which I have attempted to translate—written by the younger Pliny to his wife, who had gone to take the baths at Baiæ:—

"Caius Pliny to his own Calpurnia,—Greeting.

"It passes belief how I am constrained with longing for your return, chiefly because I love you so well, and then because we are not used to being separated. Hence it is that I pass half the night lying awake and thinking of you; hence in the daytime, at those hours when I used to visit you, my feet lead me literally of their own accord to your drawing room, and I go back again from the empty doorway, sad and sorrowful, like a forbidden lover. The only time that is free from these tortures is when I am being worried in court by my friends' lawsuits. Imagine, dear, what my life is like, when I find rest in my work, and comfort in being bored!"

The next letter I shall quote is one which was written by Richard Steele to Mary Scurlock, about a week before their marriage:—

"Sep. 1, 1707.

"It is the hardest thing in the world to be in love, and yet attend to business. As for me, all who speak to me find me out, and I must lock myself up, or other people will do it for me.

A Gentleman asked me this morning, 'What news from Lisbon?' and I answered 'She is exquisitely handsome.' Another desired to know when I had been last at Hampton Court. I replied, 'It will be on Tuesday come se'nnight.' Prythee allow me at least to kiss your hand before that day, that my mind may be in some composure. O love!

'A thousand torments dwell about thee,
Yet who would live to live without thee?'

Methinks I could write a volume to you; but all the language on earth would fail in saying how much, and with what disinterested passion

I am,
Ever yours,
RICHARD STEELE."

The two letters which I have quoted seem to me to be good samples of sound and healthy love letters. They are far removed alike from the self-tormenting moods and want of restraint that impair the letters of so many passionate lovers—such as John Keats'—and also from the sentimentality and vapid Arcadianism which render so many letters of the less passionate kind intolerable.

II.—PRECATORY.

The begging letter is not usually a dignified composition, and is sufficiently familiar. Perhaps it would be enough to quote the postscript of a begging letter, for the sting of these insects is generally located in

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the tail. A letter was written, at Leicester, on January 13th, 1709, by Dr. Jonathan Swift. It is addressed to the Earl of Halifax, and there is nothing precatory in the body of the epistle, but the P. S. runs thus:—

"Pray, my Lord, desire Dr. South to dy about the fall of the leaf, for he has a Prebend of Westminster, which will make me your neighbour, and a sine-cure in the Country, both in the Queens gift, which my friends have often told me would fit me extremely; and forgive me one word, which, I know not what extorts from me, that if my Lord President would in such a juncture think me worth laying any weight of his credit, you cannot but think me persuaded that it would be a very easy matter to compass, and I have some sort of pretence, since the late King promised me a Prebend of Westminster, when I petitioned him in pursuance of a recommendation I had from Sir William Temple."

Fortunately, or unfortunately, Lord Halifax died a year before any vacancy occurred, and Swift never obtained the preferment he sought.

I should like to add one specimen of a very common kind of begging letter—that of the public-school boy. The following letter was written at Eton College, on the 7th November, 1478, from an Eton boy to his elder brother:—

"Ryght reverent and worschipful brodyr,—I recomaunde me on to you, desyrnge to here of your wellfare and prosperity; letting you wete that I have received of Alwedyr a letter, and a noble in gold therein. Furthermore my creansyr [creditor] Mayster Thomas, heretely recomaunded him to you, and he praythe you to send him some mony for my commons; for he seyth you be twenty two shillings in his debt, for a month was to pay for when he had money last.

"Also I beseech you to send me a hose cloth, one for the halydays of sum colour, and another for the working days, how coarse soever it be it maketh no matter; and a stomacher, and 2 shirts, and a pair of slippers. And if it like you that I may come with Alwedyr by water and sport me with you in London a day or two this term time, then ye may let all this be, till the time that I come and then I will tell you when I shall be ready to come from Eton, by the grace of God Whom have you in his keeping.

"Wretyn the Saturday next after All Halown Day with the hand of your,

"Brodyr,

"William Paston."

III.—NARRATORY.

We now come to what Howell calls "narratory letters." To this class belongs the great mass of correspondence which details news or chit-chat, whether political or social, literary, artistic or personal. Out of the vast number of good news-telling letters, it is difficult to select any one or two which are conspicuously better than the rest. Political letters are generally very dull reading after a few generations, always excepting those of Cicero, which are so incomparably well written that they are never stale. Letters of social gossip and literary chit-chat, on the other hand—such as those of Horace Walpole and of the great French letter-writers—preserve a perennial freshness, and often improve by keeping. The best are too long and too numerous to quote: it is an easier task to pick out some gems which reflect the personal habits and tastes of the writer. Let me quote, for the sake of its brevity, and as a sample of the sort of epistolary chat which would diffuse good humour round any breakfast table, one of Elia's letters to Southey:—

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"1795.

"Dear Southey,—My tailor has brought me home a new coat lapelled, with a velvet collar. He assures me everybody wears a velvet collar now. Some are born fashionable, some achieve fashion, and others, like your humble servant, have fashion thrust upon them. The rogue has been making inroads hitherto by modest degrees, foisting upon me an additional button, recommending gaiters, but to come upon me thus in a full tide of luxury, neither becomes him as a tailor, or as the ninth of a man. My meek gentleman was robbed the other day, coming with his wife and family in a one horse shay from Hampstead; the villians rifled him of four guineas some shillings and halfpence, and a bundle of customers' measures, which they swore were banknotes. They did not shoot him and when they rode off he addrest them with profound gratitude, making a congee: 'Gentlemen, I wish you good night, and we are very much obliged to you that you have not used us ill'!

"And this is the cuckoo that has had the audacity to foist upon me ten buttons on a side, and a black velvet collar. A cursed ninth of a scoundrel!

"Yours sincerely,

"CHARLES LAMB."

There are many other letters of this personal kind which it is very hard not to quote, but I must be content with a part of one which illustrates the kindly humour of a great statesman and man of the world, who always retained the "child's heart within the man's." It might have been written by the late Lord Iddesleigh. After discoursing of high and weighty matters of State, the writer* concludes thus:—

"And now I come to your jokes, since you have brought on as an after-piece to Accius's Oenomaus, not an Attelane comedy, as the fashion used to be, but as it now is, a farce. What do you mean by talking to me about pilot-fish and thunny, or a dish of stockfish and cheese? I was good natured enough to put up with such things before, but the case is altered now. I have Hirtius and Dolabella as my pupils in speaking, my masters in dining. For I suppose you have heard, if perchance all the news reaches you, that they come regularly to declaim at my house, I go to dine with them. But it is no use for you to plead insolvency to me; for before, when you were well off, I could allow you to be particular about small savings, but now that you bear the loss of your property with such a good courage, you must not persuade yourself to think that when you entertain me I can accept any composition. But even such a blow comes less heavily from a friend than from a debtor. Yet I do not want the sort of dinner, when there would be a great deal left untouched: let what there is be choice and delicate. I recollect your telling me of a dinner of Phamea's: I should prefer it earlier; but everything else in the same style. But if you persist in reducing me to a dinner like your mother's, I will put up even with that. For I should like to witness the courage that would dare to set before me such fare as you talk of, or even a polypus dressed like the 'Vermilion Jupiter.'

"Believe me, you will not venture: before my arrival the fame of my new luxury will reach you; you will be terrified thereby. Neither is it of any use for you to place any hopes in the first course, since that I have abolished; for I used to have my appetite spoilt before by your sausages and olives—But why do I talk of such things? I only wish I could come to you. Indeed, as I wish to efface all alarm from your mind, you may come back to your ancient stockfish and cheese. I will bring one expense on you: you will have to make the bath hot: everything else as usual: what I said just now was only in fun."

Of the letters of travellers, which must come into this bulky category of narratory letters, I think that the best, perhaps, are the beautiful pictures of Italian life and scenery written by Shelley, Lady Mary Wortley

* Cicero.

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Montagu's description of her experiences in Turkey, and the cheerful, manly letters written by Byron during the last few months of his life. One of the most amusing of travellers' letters was published anonymously in the year 1755, in a "Select Collection of Original Letters written by the Most Eminent Persons on various entertaining subjects." In this epistle a Devonshire man writes to a friend at Exeter, giving a detailed account of his first journey to London. On the first day he travelled from Exeter to Dorchester, but "nothing signal befel us."

"We dined this day upon a leg of mutton and spinage, and had good Southam Cider. As soon as we came to our inn, I took a view of Dorchester. It has a Market-house in the midst of it, and there is a river running by it, in which it is credibly reported there are some fish. We supped this night upon a neck of mutton and broth, and some rare October, as pale as sack, and as soft as sherry, and as strong as brandy - rare beer indeed!"

The next day they came to Blandford, and our traveller took a view of this place also:—

"It has also a Market-house in the centre, and a river running by it, near unto which is store of meadow ground. We dined upon a good fat gammon and greens, and had, moreover, excellent October."

The next day they dined upon beef and carrots—"the October not strong enough"—and in the evening arrived at Salisbury. This is his description of the Cathedral City:—

"When we came to Salisbury, I walked into the Market-place and around it for at least a quarter of an hour, because I would be able to give a good account of this City. It lies low and has water about it; it has a large Market-place and they say they have a brave large Church, but our beer at the inn was very bad. We supped this night on bacon and fowls, the October stark enough."

The next day this "Eminent Person" reached Stockbridge. He wrote:—

"Stockbridge is famous for store of fish, upon which I concluded, before I saw it, that it had a good river near it, and it proved so. Here I drank some bottled ale, and a dram after it—excellent French Brandy! Sutton has nothing extraordinary, but that it is a poor little ordinary town. We dined this day upon a hog's face and a couple of rabbits. No good beer."

The next night he stopped at Hertford Bridge:—

"My Landlady was a widow woman, and a very good woman she was; I never supped better in my lifetime. We had bacon and eggs and a roasted turkey and some good brown beer."

As he was passing through Brentford he saw sitting upon a bench in the street a grave, fat old gentleman, with whiskers and a fur cap; he had likewise on a long, grave coat:—

"I bowed to him, taking him to be the Mayor of the Town, but they told me he was a waterman past business. Here I drank half-a-pint of Lisbon—very good!"

Of Hammersmith he says:—

"The ale here was but poor stuff. The country hereabouts is well wooded, and very full of people."

As to Kensington:—

"The ale here is stark enough, and we went through Hyde Park to London which is as pretty a piece of road as ever crow flew over.

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"London is certainly the greatest city upon earth, at least there is nothing like it in Devonshire; but our beer is infinitely better than theirs, which is as black as bull's blood, and as thick as mustard. The houses are all built of brick, and for the most part one house holds several families, so fond are people of living in London notwithstanding the badness of the drink. I went to see St. Paul's Church, (which is almost as big as a town, and much taller) to see my Lord Mayor. He was an elderly man in a red gown, pretty fat, and slept all the time of divine service."

Then he went to Westminster Hall, where, he says:—

"The lawyers stroll and look d—d sharp and greedy for fees. There are in the hall other toymen besides lawyers, and they will sell you their baubles at treble prices, so that there is nothing but biting on all hands. Not far from hence is the House of Commons. I went to see it, and to see the manner of their proceedings, and came away very much dissatisfied; for a dozen members talked at a time, and I could not understand a word of the debate. I also visited the House of Lords; there indeed I perceived more order, but neither heard nor saw anything remarkable, but some grave folks in odd habits."

IV.—OBJURGATORY.

I do not know any private letter which is a good specimen of the "objurgatory" letter, but I shall beg leave to make an extract from what appears to me to be the most scathing and powerful of the letters of Junius. It is addressed to the Duke of Grafton:—

"The character of the reputed ancestors of some men has made it possible for their descendents to be vicious in the extreme, without being degenerate. Those of your Grace for instance, left no distressing examples of virtue, even to their legitimate posterity; and you may look back with pleasure to an illustrious pedigree, in which heraldry has not left a single good quality upon record to insult or upbraid you. You have better proofs of your descent, my Lord, than the register of a marriage, or any troublesome inheritance of reputation. There are some hereditary strokes of character by which a family may be as clearly distinguished as by the blackest features of the human face. Charles the First lived and died a hypocrite. Charles the Second was a hypocrite of another sort, and should have died upon the same scaffold. At the distance of a century we see their different characters happily revived and blended in your Grace. Sullen and severe without religion, profligate without gaiety, you live like Charles the Second, without being an amiable companion: and for aught I know may die as his father did, without the reputation of a martyr."

If the Editor of the "Fortnightly Review" were to throw open his choice of fine quotations to universal suffrage, I am in some doubt whether I should not choose this passage as the high-water mark of English prose style.

V.—MONITORY.

Now for a "monitory" letter:—

"Near Leeds, July 28th, 1775.

"(*To* John King, *a Preacher in America.*)

"My dear Brother,—Always take advice or reproof as a favor; it is the surest mark of love.

"I advised you once, and you took it as an affront; nevertheless I will do it once more. Scream no more, at the peril of your soul. God now warns you by me, whom he hath set over you.

"Speak as earnestly as you can, but do not scream. Speak with all your heart, but with a moderate voice. It was said of our Lord, 'He shall not *cry*' the word properly means, He shall not *scream.*

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"Herein be a follower of me, as I am of Christ. I often speak loud, often vehemently, but I never scream, I never strain myself. I dare not. I know it would be a sin against God and my own soul. Perhaps one reason why that good man Thomas Walsh, yea and John Manners too, were in such grievous darkness before they died, was because they shortened their own lives.

"O John! Pray for an advisable and teachable temper! By nature you are far from it; you are stubborn and headstrong. Your last letter was written in a very wrong spirit. If you cannot take advice from others, surely you might take it from your affectionate Brother,

"JOHN WESLEY."

VI.—CONGRATULATORY.

As a specimen of the "congratulatory" letter I will quote the end of one written by Sir Francis Bacon to Sir Thomas Bodley, with a copy of the "Advancement of Learning." It is a very graceful compliment to the founder of the Bodleian Library.

"Date 1607.

Bacon says that he has dedicated the book to the King, 'and the second Copy' he continues 'have I sent unto you, not only in good affection, but in a kind of congruity, in regard of your great and rare desert of Learning. For Books are the Shrines where the Saint is, or is believed to be. And you, having built an Ark to save Learning from Deluge, deserve in propriety, any new Instrument or Engine whereby Learning should be improved or advanced'.

The class of congratulatory letters includes the letter of thanks. There are so many gems of courtesy in this kind of correspondence that it is difficult to make any selection. Perhaps, after all, nothing is more to the point than Sydney Smith's well-known letter of thanks to the author of "Ingoldsby," and it has the brevity of wit:—

"29, Green St., Nov. 15, 1841.

"Many thanks, my dear Sir, for your kind present of game. If there is a pure and elevated pleasure in this world, it is the roast pheasant and bread sauce:—barn door fowls for Dissenters, but for the real Churchman, the thirty-nine times articled clerk, the pheasant! the pheasant!"

"Ever yours,

"SYDNEY SMITH."

VII.—CONSOLATORY.

Our last class of letters consists of those which were written for the purpose of condolence and consolation; and in this class there is, as might be expected, the deepest tone and the purest beauty. I should like to quote the letter which Servius Sulpicius wrote to Cicero on the death of Tullia, Cicero's dearly loved daughter, and Cicero's answer, but they are too long, and, beautiful as they are, they are in some respects foreign to our English sympathies. It cannot but appear strange to us that Sulpicius should draw his main source of consolation to the bereaved father from the darkness of the political horizon. Even as thoroughgoing a Tory as Cicero was would hardly, now-a-days, be consoled for the loss of a favourite child by the reflection that she was at least spared the sight of a Dublin Parliament and a Disestablished Church—at least no friend would venture upon such a method of condolence. The letter of consolation which I propose to quote is of a more catholic type.

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The thoughts which it embodies are not bound up with any passing phase of life, but touch that general heart of human nature which is always and everywhere the same :—

"February 17, 1657.

"To JOHN EVELYN,

"Dear Sir,—If dividing and sharing griefs were like the cutting of rivers, I dare say to you, you would find your stream much abated ; for I account myself to have a great cause of sorrow, not only in the diminution of the number of your joys and hopes, but in the loss of that pretty person, your strangely hopeful boy.

"I cannot tell all my own sorrows without adding to yours, and the causes of my real sadness in your loss are so just and so reasonable, that I can no otherwise comfort you but by telling you that you have very great cause to mourn ; so certain it is that grief does propagate as fire does. You have enkindled my funeral torch, and by joining mine to yours, I do but increase the flame. '*Hoc me malè urit*' is the best signification of my apprehension of your sad story. But, Sir, I cannot choose, but I must hold another and a brighter flame to you, it is already burning in your heart ; and if I can but remove the dark side of the lantern, you have enough within you to warm yourself and to shine to others. Remember, Sir, your two boys are two bright stars, and their innocence is secured, and you shall never hear evil of them again. Their state is safe, and heaven is given to them upon very easy terms; nothing but to be born and die. It will cost you more trouble to get where they are; and amongst other things one of the hardest will be, that you must overcome even this just and reasonable grief ; and indeed, though the grief hath but too reasonable a cause, yet it is much more reasonable that you master it. For besides that they are no losers, but you are the person that complains, do but consider what you would have suffered for their interest : you would have suffered them to go from you to be great princes in a strange country ; and if you can be content to suffer your own inconvenience for their interest, you command (? commend) your worthiest love, and the question of mourning is at an end. But you have said and done well, when you look upon it as a rod of God ; and he that so smites here will spare hereafter ; and if you by patience and submission, imprint the discipline upon your own flesh, you kill the cause and make the effect very tolerable ; because it is in some sense chosen, and therefore in no sense insufferable.

"Sir, if you do not look to it, time will snatch your honour from you, and reproach you for not effecting that by Christian philosophy which time will do alone. And if you consider, that of the bravest men in the world, we find the seldomest stories of their children, and the apostles had none, and thousands of the worthiest persons, that sound most in story, died childless : you will find it is a rare act of providence, so to impose upon worthy men a necessity of perpetuating their names by worthy actions and discourses, governments and reasonings. If the breach be never repaired, it is because God does not see it fit to be ; and if you will be of this mind, it will be much the better.

"But Sir, you will pardon my zeal and passion for your comfort, I will readily confess that you have no need of any discourse from me to comfort you.

"Sir, now you have an opportunity of serving God by passive graces : strive to be an example and a comfort to your Lady, and by your wise counsel and comfort, stand in the breaches of your own family, and make it appear that you are more to her than ten sons. Sir, by the assistance of Almighty God, I purpose to wait on you sometime next week, that I may be a witness of your Christian courage and bravery, and that I may see that God never displeases you as long as the main stake is preserved—I mean your hopes and confidences of heaven.

"Sir, I shall pray for all that you can want—that is, some degrees of comfort, and a present mind, and shall always do you honour, and fain also would do you service, if it were in the power, as it is in the affections and desires of

"Dear Sir,

"Your most affectionate and obliged Friend and Servant,

"JEREMY TAYLOR."

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With the music of this noble letter in our hearts, we may fitly take leave of our subject. I will only add that it is a matter of surprise to me that there exists no convenient anthology of good letters. The "Collection of Original Letters," published in 1755, from which I have quoted, has had some successors, such as the "Letters of Eminent Persons," selected and illustrated by R. A. Willmott, in 1839, and this has lately been followed up by a volume in Nimmo's Standard Library, called "The British Letter-Writers, a collection of the best English Letters from the 15th Century to the Present Time." The latter book is, however, too bulky for the purpose of an anthology. More convenient in size, but still too large and equally restricted in area, is the selection entitled "Four Centuries of English Letters," edited by Mr. Baptiste Scoones, and published in 1880. A handy Golden Treasury of the Best Letters, chosen with patient diligence and fine taste, is still among the books of the future. If anyone require warrant for the value of such a volume, let him take the authority of Bacon, who said: "Letters, such as are written from wise men, are, of all the words of men, in my judgment, the best."

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

The Section has held three Meetings during the quarter, with an average attendance of eleven Members.

December 20th.—Mr. CHAS. J. BILLSON, M.A., read a paper entitled "Letters from the Dead" (printed at page 22). A discussion followed, in which Mr. PAUL, Mr. DAWSON, and others, took part.

January 17th.—Mr. W. SIMPSON, Jun., read a paper on "Bimetallism," an abstract of which is appended:—

Currency problem of immense importance. Special Students not agreed upon the facts bearing upon the problem, still less upon their true interpretation. Object simply to state the question. Bimetallists propose to supplement the decreased supply of gold by coining silver, and admitting it to an unlimited extent as legal tender. Silver demonetised by chief European States. France was compelled in 1873 to give up Bimetallism. Connexion between quantity of coinage and prices of commodities. Increased money in a country raises prices, whilst decreased money lowers them. To keep prices steady should be the chief object of currency authorities. For last 36 years the world's supply of gold has been decreasing, but there is conflict of opinion whether there is scarcity of gold in England now. This question is at the root of the matter. Recent fall in prices admitted. Several causes contributed to this fall—methods of cheapening production—Cheques, and other substitutes for money. Doubtful how far appreciation of gold has caused fall. Effects of falling prices to disturb and depress commerce. Neither high nor low prices desirable; but fixed standard of prices—freedom from fluctuations. Bimetallism would supply deficiency of gold by resorting to silver, which is plentiful. This involves fixing a ratio between the two metals; unless the leading nations agree upon this ratio, we must remain Monometallists. Depreciation of silver not due solely to natural law, but to state action in demonetizing silver. Bimetallism not opposed to free trade. Difficulty of *maintaining* fixed ratio considered. The appreciated metal would tend to fall into disuse, debtors preferring to pay in the less valuable metal. Temporary disturbance on introduction of Bimetallism might be counterbalanced by permanent advantage of greater abundance of money, and

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stability in standard of value. Evils in International transactions between gold-standard and silver-standard countries, as England and India, owing to variations in value. Questions raised by Bimetallism cannot be definitely answered. Report of Royal Commission will be useful, but the problem depends upon the unknown *future* production of the two metals, no less than upon the many disputed *present* facts.

The paper was followed by a discussion in which Mr. MOTT, Mr. PAUL, and others, took part.

February 21st.—In the absence of the Chairman of the Section, the chair was taken by Mr. C. J. BILLSON, M.A., who made a communication to the Section with reference to certain information required by Committees of the British Association.

Information is requested by the Prehistoric Remains Committee of Section H—to be sent to the Secretary, J. W. Davis, Esq., F.G.S., Chevinedge, near Halifax—as to the localities in which evidences are found of the existence of prehistoric inhabitants. General Pitt Rivers, of 19, Penywern Road, S. Kensington, London, S.W., also desires, on behalf of the Ancient Monument Act Committee, that Local Societies should report to him what monuments in their district they think worthy of being put under the Act; should send him the names and addresses of the owners; communicate with the owners, and obtain their consent to have the monuments placed under the Act; and should report any damage that they find being done to them. After a discussion upon this subject,

The Rev. A. P. DAWSON read a paper on "Walter Savage Landor," an abstract of which is appended:—

Walter Savage Landor is a writer unique in literature. In depth and width of scholarship and culture, in mental power, in the marvellous intellectual sympathy he established between himself and the almost endless variety of actors on the world's stage whom he introduces in the "Imaginary Conversations"; in his almost perfect and unrivalled force of concise expression, he is undoubtedly among the foremost in the first rank of literary men. On almost any page, taken at random from his works, more than one idea beautifully and tersely expressed will be found which will add to the reader's wisdom, and act as a tonic on his mental system. Yet he is one of the most unknown and unread of what are termed classical writers. Attempts have lately been made to popularise him.

1. There is Prof. Sidney Colvin's excellent "Selections from Landor"—a contribution to the "Golden Treasury" series.
2. There is a discriminating biography by the same hand in the "English Men of Letters," edited by John Morley.
3. In the Camelot Classics there is a very pleasing selection from the "Imaginary Conversations."
4. "Gebir" and "Count Julian" have been published in "Cassell's National Library."

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But notwithstanding these facilities, it is probably still true, that the great majority of well educated people lose a great deal of pleasure, and of profit, by neglecting to read Landor. Yet when we consider the intellectual stature of those who have been enthusiastic over him, and the depth of their enthusiasm, it is very wonderful that this should be the case, as is witnessed by the following by no means exhaustive list of his eulogists.

Robert Southey, who was his first literary friend, and the most loyal friend man ever had. Julius Hare, who said that his writings contain more and more various beauty than any collection of the writings of any English author since Shakespeare. Robert Browning, Mrs. E. B. Browning, Carlyle, De Quincey, Charles Dickens, who drew him to the life in Lawrence Boythorn in Bleak House; Hazlitt, Leigh Hunt, Charles Lamb, Lord Houghton, who said of his "Conversations" "of them the best are of the very best, perhaps unsurpassed in our language, and in foreign literature only equalled by Voltaire and Goethe. J. R. Lowell, and Emerson, who tells us that he came to England chiefly to see four or five remarkable Englishmen, of whom Landor was one; and Swinburne who went to Rome solely to make his acquaintance.

Yet Landor's life was a failure owing to his impetuous temper, and his wrong-headedness; and his works have never become really popular, partly no doubt because of the great amount of knowledge they presuppose in the reader, and partly from the fact that there is in them a want of continuity, because he was a man of great thoughts rather than a great thinker.

Landor was born at Warwick in 1775, and was educated at Rugby, and at Trinity College, Oxford, and from both he was removed for violent temper and insubordination. He refused to adopt any profession, but devoted himself to literature, being perhaps the one known instance in which the tradition of the classical education of our schools took full effect, and was carried out to its furthest practical consequences. He cannot be said ever to have had any settled home; for, wherever he lived, sooner or later he quarrelled with his neighbours, and had to go. He lived at Swansea, at Bath, and at Llanthony Priory in Wales, where he was most unfortunate in the estate that he purchased. For many years he lived at various places on the Continent, and he is perhaps chiefly thought of in connection with Fiesole, where he dwelt for some years. He was unhappy in his marriage, and latterly lived apart from his wife, for whom, however, he made ample provision; and he died in poverty at Florence in 1864, at the age of 89.

Landor's publications were very numerous. It will suffice to mention the more important. The first to attract notice was "Gebir" a Poem relating to the mythic founder of Gibraltar, in which two brothers, representatives of the peaceful and militant nature, are each, after the ancient manner, assisted by sympathetic supernatural agencies, and display the old moralities of the barrenness of conquest, and the omnipotence of love. This was the Poem that Shelley was never tired of reading, and

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to which Wordsworth was indebted for a passage in the "Excursion," and Byron in the "Island."

"Count Julian" was probably his best dramatic attempt in verse; but Landor's chief title to a niche in the temple of fame rests on his "Imaginary Conversations," which he commenced when about forty-six years of age, and continued at intervals, almost till his death. Of these he wrote over one hundred and twenty, on almost every conceivable subject. The most admired of them are the classical ones; but many are hard to follow, both because they are so condensed, and because of the amount of antecedent knowledge they pre-suppose in the reader, and the necessity he is under of being in sympathy with the mind of the author.

The "Examination of Shakespeare" was greatly praised by Charles Lamb, who said that it could only have been written by two men, he who wrote it, and he on whom it was written.

"Pericles and Aspasia" is a series of letters relieved by fragments of verse, intended to set before us Greek life and thought in Athens.

The "Pentameron" is a series of imaginary interviews between Petrarch and Boccaccio. He also wrote several Plays, none of which were ever acted, or indeed could be acted, though they are all powerful. In all his writings perhaps the most noticeable feature in Landor is his individuality. He says of himself when composing: "When I think of writing on any subject, I abstain for a long while from every kind of reading, lest the theme should haunt me, and some of the ideas take the liberty of playing with mine; and I do not wish the children of my brain to imitate the gait or learn any tricks of others."

WM. JACKSON, *Chairman.*

SECTION "C."

FOR GEOLOGY.

January 12th.—Mr. H. E. QUILTER read an interesting paper on "Fossil Foraminiferæ," and several excellent microscopical specimens were afterwards exhibited.

February 9th.—Mr. J. D. PAUL read an instructive paper on the "Geology of the neighbourhood of Gilsland," and gave an account of such objects of interest as came under the writer's observation during a fortnight's stay in the Waverley Country, on the borders of Northumberland and Cumberland.

The structure of the Cheviots was described with their core of Silurian rocks, which was very early raised and contorted, and next covered by a volcanic outburst of Syenites and their ejectamenta. Both in their material, and in their method of deposit, there is said to be a close resemblance to what is found in the rocks of Charnwood Forest.

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An explanation followed of the Physical Geology of Northumberland, with the local peculiarities of the *Tuedians* and *Bernicians*, and their relation to the formations of the same age to the north and south of them. The very striking outline of lias close to Carlisle was also noticed.

C. A. MOORE, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

December, 1887.—No meeting held.

January, 25th, 1888.—Eleven members present.

Exhibits—Mr. GRUNDY, a Sulphur Butterfly, *Gonepteryx rhamni*, caught in Hampshire on January 3rd.

Miss GRUNDY, a dried specimen of a composite plant, commonly called the "Flannel Plant," from Sydney.

The CHAIRMAN read a paper on "Improved Methods of Examining and Estimating the Living Organisms of the Atmosphere." He first gave a brief and lucid description of the more common forms of *Bacteria* and *Bacilli*, and mentioned the various diseases of Man and Animals in which they have been discovered; and discussed the probability of their being the cause of such diseases. He also stated the good effects they cause by the dispersal of dead organic matter, and by producing chemical changes in the soil. He then described Hesse's and Frankland's methods of estimating the number of organisms in a given quantity of air, and demonstrated Hesse's method by showing how a given quantity of air is drawn through a glass cylinder, coated with a film of stenlized gelatine, on which the organisms are deposited, and are thus rendered susceptible of further cultivation and examination.

February 15th.—Eleven members present.

Exhibits—The CHAIRMAN, Microscopical Slides of Micrococci, &c.

Dr. FINCH, a specimen of the Whipcord Lycopod.

Mr. E. F. COOPER, a large and fine Collection of Dried Plants from Hyères in France.

Mr. F. T. MOTT, F.R.G.S., read a paper on "The Cause and Limits of Organic Growth" (printed at page 13).

HY. TOMKINS, *Chairman.*

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SECTION "E."

FOR ZOOLOGY.

December 12th.—On the proposition of Mr. H. E. QUILTER, seconded by the CHAIRMAN, Mr. R. WARDEN HARVEY was elected an Associate of the Section.

Mr. H. E. QUILTER read the first instalment of a paper on "The Comparative Anatomy and Physiology of a Fresh-water Mussel," in which he gave a brief sketch of the principal anatomical characteristics of the Mollusca in general, before proceeding to consider in a more detailed manner, the structure of the Fresh-Water Mussel itself. In his subsequent remarks, Mr. QUILTER gave some interesting information relative to the connection which may exist between the nature of the habitat, and more or less well-marked varieties of the shell valves, and called special attention to the various theories which have been advanced concerning the formation and growth of the shell valves, stating that the one now most generally received, regarded it as a process of growth by intussusception.

No specimens were brought to this meeting for exhibition.

January 16th.—A paper by the SECRETARY on "The Diurnal Lepidoptera of Leicestershire" was read, in his absence, by Mr. G. H. STORER, in which a detailed list of 29 species was given—some of them of considerable rarity.

Mr. H. E. QUILTER reported that he had received that morning three specimens of the rare Slug, *Testacella scutulum*, Sow, from Belvoir Gardens, a spot which had for some time been regarded as a likely habitat for the species.

Objects Exhibited—A number of British Diurnal Lepidoptera, by the SECRETARY.

February 13th.—The SECRETARY read a few notes descriptive of some Physiological Slides which had been brought for exhibition.

The endochondral formation of bone was briefly sketched, the various stages of development being clearly shown in a vertical longitudinal section of the human finger, at an early period of life. Fine specimens of the large stellate or multipolar nerve cells from the spinal cord of the Ox, were also exhibited, and their chief points of interest mentioned; and the section of a human lumbar nerve was interesting, as showing very well the disposition of nerve fibres to form a nerve trunk, with the *epi-peri-* and *endoneural sheaths*, &c.

Objects Exhibited—Testacella scutulum, Sow, from Belvoir Gardens; *Achatina acicula*, Müll, and *Carychium minimum*, Müll, from Nottinghamshire, with numerous Slides of Foraminifera, chiefly from the Carboniferous Limestone, by Mr. H. E. QUILTER.

Goosander *(Mergus merganser, L.)* female, by Mr. F. F. How.

A number of Physiological Micro Slides, by the SECRETARY.

W. A. VICE, *Chairman.*

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Announcements

FOR APRIL—JUNE, 1888.

SECTION "D."

Chairman—HENRY TOMKINS, M.D., Fosse Road, Leicester.
Secretary—C. W. COOPER, M.B., King Street, Leicester.

EVENING MEETINGS.

Wednesday, April 25.—Exhibits. Paper by Mr. MOTT on "The Native Trees of Leicestershire."

Wednesday, May 16.—Exhibits. Paper by Mr. E. F. FRANKLIN on "Cheirognomy."
Field Excursion—date to be fixed.

Wednesday, June 20.—Exhibits. Paper by Dr. FINCH.
Field Excursion—date to be fixed hereafter.

HY. TOMKINS, *Chairman.*

SECTION "E."

Chairman—W. A. VICE, M.B., 5, Belvoir Street.
Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

April 9.—Paper by Mr. G. H. STORER. "Notes on the Natural History of the Natterjack Toad," (*Bufo calamita*),—with Specimens.

May 7.—Paper by Mr. MONTAGU BROWNE, F.Z.S. "Some Notes upon the remains of *Cervidæ* found in Leicestershire,"—with Specimens.

June 4.—Notes and Exhibits by various Members.

The Paper of the evening will be read at 7.45; any business before the Section being then adjourned.

W. A. VICE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART VIII., JULY, 1888.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 18TH, 1888.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
1888.

[*Price Sixpence.*]

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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

At the FIFTY-THIRD ANNUAL GENERAL MEETING of the Society, held in the Lecture Hall, Town Museum, on Monday, the 18th of June, 1888, at 7 p.m.

A. H. PAGET, Esq., Retiring President, in the Chair.

The CORRESPONDING SECRETARY presented the Annual Report of the Council and the Reports and Transactions of the Sections.

The Financial Statement, as audited, was read.

Moved by Mr. T. CARTER, LL.B., seconded by Mr. T. C. LEE.

(1.) "That the Annual Report and Financial Statement be received."

Carried.

(2.) "That the Annual Report and Financial Statement be adopted and printed for circulation."

Carried.

The retiring PRESIDENT then vacated the Chair in favour of the Rev. A. P. DAWSON, M.A., the new President, who addressed the meeting.

Mr. T. CARTER, LL.B., having withdrawn his name from the list of Persons nominated as Vice-Presidents, no voting for any of the Officers was required, as only a sufficient number of persons were nominated to fill the several offices.

The PRESIDENT, therefore, declared the following gentlemen nominated and duly elected.

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Vice-Presidents.

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
A. H. PAGET.
G. STEVENSON.

Treasurer.

ALFRED PAGET.

Council.

REV. E. ATKINS, B.Sc.
E. CLEPHAN.
C. W. COOPER, M.D.
HERBERT ELLIS.
J. H. GARNAR.
R. HARVEY, LL.B.
W. KELLY, F.S.A., F.R.H.S.
W. KEMPSON.
T. C. LEE.
F. M. POPE, M.D.
REV. T. A. PRESTON, M.A.
C. F. WIKE.

Honorary Secretaries.

CORRESPONDING SECRETARY ... ... C. J. BILLSON, M.A.
MINUTE SECRETARY ... ... WM. SIMPSON, JUNR.
FINANCIAL SECRETARY ... ... GEORGE HULL.

Moved by Rev. J. WENT, M.A., seconded by Mr. E. T. LOSEBY—

"That the thanks of the Society be given to the Honorary Secretaries and other Officers of the Society for their services during the past year; to the Representatives and Proprietors of the Local Press for their Reports of the Society's proceedings; and to the Curator for his services to the Museum."

Carried.

Moved by Mr. F. T. MOTT, seconded by Dr. FINCH—

"That Mr. E. CLEPHAN and Mr. T. C. LEE, be elected Auditors for the ensuing year."

Carried.

Moved by Mr. W. SIMPSON, seconded by Mr. E. F. COOPER—

(1). "That the Rules be altered, by making it the duty of the Council to elect the Vice-Presidents, Treasurer, and Secretaries, as well as the President; and that the Council be instructed to prepare the necessary verbal alterations in the Rules."

Rejected.

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Moved by Mr. W. SIMPSON *(pro formâ)*, seconded by Mr. F. T. MOTT—

(2). "That the following Rule be substituted for Rule VI.—"The President, Vice-Presidents, Treasurer, and Secretaries shall be appointed by the Council. The twelve members of Council to be appointed annually, shall be elected in the following manner:—Two weeks before the Annual Meeting, there shall be sent to each member of the Society, a list of all the members who are eligible for election on the Council, with a notification of the time and place of meeting, and the following note of instructions:—'You are entitled to vote for twelve members of Council. You can do so by placing a mark against any twelve names notified as eligible, or you can vote in the same way for any less number. The paper so marked, must be returned to one of the Secretaries three days before the Annual Meeting, that is to say not later than the day of next. It will then be the duty of the Secretaries to act as Scrutineers, and to report to the Annual Meeting the names of the twelve persons who have received the highest number of votes. These shall thereupon be declared to be elected as members of the Council. In the event of any person so elected declining to serve, the Council shall in his stead appoint the person receiving the next highest number of votes. The note of instructions shall contain a list of the names of the newly-elected President, Vice-Presidents, Treasurer, and Secretaries, and of the twelve continuing Councillors as not eligible for election, and a list of the retiring members of the Council. In case of equality of votes, the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council."

Rejected.

The above proposed alterations of Rules were recommended by the Council. Neither of them was carried by the two thirds majority of the members present, as required by Rule XVII., but the former was carried by a majority of those voting; 11 to 7.

At a meeting of the Council, held immediately after the Annual Meeting, Mr. T. CARTER, LL.B., and Mr. J. J. W. KNOWLES, were duly elected members of the Council, in the places of Rev. E. ATKINS, B.Sc.; and Rev. A. P. DAWSON, M.A., elected Vice-President and President respectively.

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"SARTOR RESARTUS."

(By J. D. PAUL, F.G.S. (Read before Section "A.")

CARLYLE has, I should suppose, very few indifferent readers. He stirs up, doubtless as he wished, strong feelings of liking or of enmity. To many his style is repulsive and unintelligible, and his humour heavy and perplexing. Frequently we find it easier to make out his drift than to lay down his exact position, whilst it must be admitted that his literary sins are many. On the other hand, it is undisputable that he was a great authority in his day, and that he was one of the founders of a school which has not only challenged, but reversed the decisions of its predecessors on many important social and philosophical questions.

I have thought it might not be uninteresting to you to glance at the views and teaching of such a writer, and with this object before me I propose this evening to ask your attention to one of his earliest works, the "Sartor Resartus."

To appreciate the book we must read a good deal between the lines. We must read into it the author's peculiarities, his studies, his years, and his surroundings. Even then we shall miss the object and the character of the work unless we bear in mind the prevailing opinions and the political conditions of the world into which the author launched it.

Thomas Carlyle studied at Edinburgh, and afterwards tried school keeping, making translations from the French, and hack literary work generally. He learned German, then a very rare acquirement, and became the interpreter of Göethe to Englishmen. At 30 he married and settled for some years in a lone cottage among the hills and moors of Dumfries, where he barely maintained himself and his wife by his translations from German literature, and by writing articles for the *Edinburgh Review*, of which his friend Jeffrey was then the editor. The years spent in study, in poverty, and in wandering among the solitudes of Craigenputtock were never likely to make an optimist of such a man as Carlyle. It was soon borne in upon him that the world was sadly out of joint, and with a man so capable, so courageous, and withal such an irritable dyspeptic, it might be safely predicted that it would not be long before he would propound some method of setting it straight. Carlyle was of the stuff from which prophets are made, and Craigenputtock was the desert in which he meditated upon his message, and when he could

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endure the desert no longer and decided to enter the world, he brought up with him to London in 1834 the M.S. of "Sartor Resartus,"—the first chapter of his prophetic deliverance. By his review articles, he had already achieved several minor literary successes, and he was able to secure a commencement of its publication in *Fraser's Magazine*. But the public would have none of it. The publisher was inundated with letters threatening the withdrawal of subscriptions unless he stopped the appearance of the scare-goose in his magazine. "Sartor," Fraser informed the author, "excites universal disapprobation." It was stopped, and only reached a complete form in fifty copies simply stitched together, some of which found their way to America, where it was reprinted years before the English public cared to see it again. Thus far he had met with the usual reception of a prophet. He was not only without honour—he was stoned. Let any one call to mind what was passing in England when he delivered his message, and all surprise will at once cease. It was the era of the Reform Bill—the accession of the middle class to political power. It was the age of mediocrity. The government of England by the great families had come to an end, and there was a time of transition. We had put off the old man and had not put on the new. The class devoted to trade had grown with amazing rapidity. The ideas of this trading class dominated politics and even literature. There was much that was true in the new politics, and they suggested many changes not only beneficial and admirable in themselves, but valuable for the sake of the after improvements to which they conducted. The old frame-work was so ill adapted to the new form of Society, and such striking relief followed its partial removal that the opinion became prevalent that Society could stand with scarcely any frame-work at all, and that the art of good government was much easier than had hitherto been suspected, and was simply that of least government. Political economy, founded on Adam Smith's "Wealth of Nations," was regarded as unique among the moral sciences for the clearness, certainty, and trustworthiness of its conclusions. This political economy was not modified or checked by any milder social science, for such a science had not yet been sketched out by Comte. It concerned itself with wealth only, not men. The trader who successfully sought his own interest was regarded as a patriot, and natural greed was justified as public spirit. The great object of national existence was taught to be the accumulation of capital. It followed from this that men were only to be valued as instruments of the aggrandizement of capitalists. Ricardo, a prominent disciple of Adam Smith, taught that the wages receiver could not expect to obtain more than would give him the necessaries of life, and Malthus was supposed to have proved that every succeeding generation of workers would be paid less than their predecessors. These were the doctrines of political economy which obtained for it the name of "The dismal science."

The typical man of the age was its philosopher, Jeremy Bentham, a thinker of extraordinary acuteness. He might be called the English Voltaire. He first dared to speak disrespectfully of the British

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Constitution, and the superstitious belief in the wisdom of our ancestors received its death-blow from his hands. Everybody thought they could understand his leading principle, "the greatest happiness of the greatest number." One of the most important qualifications for a successful popular teacher he certainly possessed,—a splendid belief in himself. The simplicity of his system promoted its general acceptance, but his scheme found no place for the supposition that man was capable of pursuing spiritual perfection as an end, and that he might desire for its own sake the conformity of his own character to the highest standard of excellence he could conceive, without hope of good or fear of evil. The feelings of moral approbation, of self-respect, the sense of honour, the love of beauty were all unrecognized by Bentham.* At the time to which we have been referring the world of literature had just been fascinated by the immense genius of Byron; and Sir Walter Scott continued for years to charm his readers, but the poetry of the higher and finer feelings could scarcely exist in the atmosphere of the time. Wordsworth, Shelley, and Keats were born out of due time. Coleridge had to wait till the next generation to receive his due. Keble published his "Christian Year" in 1826, but it was comparatively unread. It was only the seed-time for men like Newman and Thomas Arnold. In general reading one is constantly coming across bits of evidence of the lamentable condition of philosophy and literature in England about the year 1830. In Trollope's "What I Remember," I., 239, he records that Milman (afterwards Dean Milman) spoke much about this time of the decay of the love of learning in England generally, and particularly at Oxford. He said that no four men could be found there who were up to the European level of the day in any branch of learning—not even theology. And speaking of England generally, he said that "in no one public library in the country could be found the books requisite for a man who wished to write a learned work on any subject whatever."

Such roughly was the world which Carlyle looked out upon from the solitudes of Craigenputtock, and it was in his walks over the hills and moorlands round his cottage home that this modern prophet became charged with his message. In form it differed much from the messages of the ancient prophets. It is true he dealt faithfully with his generation, neither did he spare his denunciations, nor was his communication wanting at times in solemnity and his belief in the truth of his message has never been challenged, but it contained, besides, a grim humour and even an element of farce, which left the reader wondering whether the modern Jeremiah whilst he prophesied was not laughing in his sleeve and poking fun at him. From beginning to end the book was such an elaborate skit that some dullards persisted in taking it seriously. It was built upon a complicated biographical and autobiographical structure. The writer was supposed to be an Englishman, who years before had

* "Dissertations and Discussion," J. S. Mill. I., 359.

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studied at the German University of Weisnichtwo (knows not where). Here he made the acquaintance of Diogenes Teufelsdröckh, Professor in the University of things in general. The Professor was without a stipend, and no one had even suggested that he should deliver any lectures. His days were spent studying in his garret and his evenings in smoking his pipe mostly in silence at the Green Goose. After his return to England the writer receives from the Professor a presentation copy of his great work, then newly published, on "Clothes, their Origin and Influence." After diligently studying the book the writer is struck with a desire to communicate this new branch of philosophy to the English public. The receipt of a letter from Herr Hofrath Heuschrecke (Herr Grasshopper) decides him to undertake this duty and he makes up his mind to publish the work anonymously. He commences with some reminiscences of Weisnichtwo and illustrations of the new philosophy, and had proceeded as far as the tenth chapter, when a second letter arrived from Herr Heuschrecke stating that he had sent off six considerable paper bags, carefully sealed, marked in gilt China ink with the signs of the southern Zodiac, stuffed with papers written over in the Professor's scarcely legible handwriting, with his opinions on every conceivable subject, and also with parts of his autobiography. The second book opens with a charming idyll of the childhood of Teufelsdröchk, and is followed by his school and college life, his study of the law, and his appointment to a minor legal office. Worked into this life of the Professor are many incidents from Carlyle's own history. At last Teufelsdröchk is launched upon his career and commences his passage through the regulation stages imposed upon every hero by the German æsthetic school. He is depressed by poverty, by his isolation, and by his incapacity to solve the Sphinx riddle of the world. He falls in love, and spends days and hours of rapture. He is jilted, and the shock carries him at once into the "Sturm und drang" period. He becomes a pilgrim and wanders over the face of the globe. A nameless unrest urges him forward, still he finds no rest for the sole of his foot. Doubts darken into unbelief. Living without God in the world, of God's light he is utterly bereft. Then suddenly, at last comes his spiritual new birth, "his mind's eyes are unsealed and his hands ungyved."

Such is the frame-work of the "Sartor Resartus." Of the dawn upon his own mind of this Philosophy of Clothes, the author has given us the secret history. We have already spoken of Carlyle as a student of German literature and especially of Göethe. He seems to have been specially struck by the introduction to the poet's great masterpiece, where Faust, by the recitation of an invocation which he finds in a book of secret lore, summons the Earth Spirit, whose appearance throws him into a state of alarmed excitement. He plucks up sufficient courage to assert himself, and exclaims with defiance:

> "Thou form of flame! Shall I yield to thee?
> 'Tis I, 'tis Faust, thine equal. I am he."

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The Spirit replies by a reference to the great *rôle* which he plays in the drama of the Universe:

"In Being's floods, in Action's storm,
I walk and work, above, beneath,
Work and weave in endless motion!
Birth and Death,
An infinite ocean;
A seizing and giving
The fire of Living:
'Tis thus at the roaring Loom of Time I ply,
And weave for God the garment thou seest Him by."

We need have no doubt that in addition to this scene he had in his mind passages in the Bible which his Scotch education had made familiar to him as household words. "The heavens are the works of Thine hands. They shall perish, but Thou remainest, and they all shall wax old as doth a garment; and as a vesture shalt Thou fold them up." He refers to the common usage by which "men are properly said to be clothed with authority, clothed with beauty, with curses, or the like." Still, it must be confessed that when we have made every allowance possible for the force of these passages, and for the aptness of the comparison of all possible things to clothes, to spin it out till it filled an octavo volume was sadly overdoing the simile. Of course, Carlyle knew well enough that such a performance was certain to annoy the Philistines of his day, and I cannot help suspecting that some malicious pleasure of this kind incited him to inflict the clothes philosophy upon them. His solitary life at Craigenputtock of course largely influenced and deteriorated his work. The tone of perfect literary sanity is wanting. He failed to measure the proportionate value of things. If he hit upon a joke he never knew when his readers had had enough of it. During a celebrated trial which took place about this time, a witness was questioned as to the character of some one whose name had been mentioned. He replied that the person referred to was "respectable," and when he was asked what he meant by "respectable," he answered, "he always kept a gig." Carlyle never succeeded in forgetting this queer measure of human character. It would intrude into whatever he wrote, like Charles the First's head in Mr. Dick's memorial. He perpetuated it in uncouth words, such as, "gigmanity." His friend Emerson, a more healthy-minded man, took him to task for this recurrence to stale jokes, but he was always liable to relapse into this failing.

Every book of this kind is an artistic composition and must therefore have some leading idea running through it, and it will never yield up its secret to us until we can not only point out, but isolate this idea—this motive of the whole piece. What we seek is not at all likely to be found lying upon the surface, for the book we are studying has obviously somewhat the character of an allegory, where the author, whilst he speaks of one thing, really often intends to draw attention to another. The "Pilgrim's Progress" is more than the description of a pedestrian excursion, and so neither the origin and influence of clothes, nor the life and opinions of this Professor of things in general is the real subject of the "Sartor

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Resartus." If we wish to reach the gist of the book, we must penetrate deeper. It is supposed to contain the thoughts of the writer as he looked out upon the world from the point of view as a philosopher. Can we discover in it an attempt to solve any of the great fundamental problems which have puzzled philosophers in all ages, or can we find in it any assumed solution of these problems.* Take that wonderful riddle to which all of us, wise and simple alike, whether we are aware of it or not, must make a reply. Every man, woman, and child has some more or less defined notion or representation of the sum of all that he knows and feels and thinks. The commonest and most popular form of this conception is probably that of two distinct worlds,—a world of mind, consisting of a multitude of individual minds, and a world of matter made up of all the extended immensity and variety of material objects.† Each of these worlds is thought of as existing independently and within its own proper bounds, though each traffics with the other. Sweep away all existing minds, and the deserted Earth would continue to spin round all the same, still whirling its rocks, trees, clouds, and all its belongings through the sunshine of the day and the darkness of the night. On the other hand, suppose the entire fabric of the material Universe abolished and dissolved, the dishoused population of spirits would still somehow survive in the imaginable vacancy. If this second notion is not so easy or common as the first, still it virtually belongs to the popular conception. We no sooner place these two conceptions before us and carefully examine them than we notice the commencement of a curious process. The picture of the material Universe becomes blurred and loses its sharpness. We are obliged to admit that much that we thought was material and external to the mind ceases to hold that position. All sensations of color and sound are at once detected as having no external independent reality. The oftener we apply our apparatus of analysis to the so-called properties of matter, the deeper we shall find that it eats into and destroys the real external world. How far this process may be carried it is not our intention to enquire, we must be satisfied with noting that some thinkers have carried it further than others, and that to those who have carried it furthest has been applied the name of Idealists, and that those who retained a larger and more important external world have been spoken of as Realists. One of the greatest teachers of the School of Idealists was Bishop Berkeley, and to his words I ask your attention for a minute or two. In paragraph III. of his immortal work on the "Principles of Human Knowledge," he writes, "That neither our thoughts, passions, nor ideas, formed by the imagination exist out of the mind, is what everybody will allow. It seems no less evident that the various sensations or ideas imprinted on the senses, however blended or combined together (that is,

* Since writing this paper, I have read Dr. Garnett's admirable life of Carlyle in Scott's Series of "Great Writers." Dr. Garnett not only takes much the same view of the "Sartor Resartus" that I have tried to set out, but in treating of Carlyle's idealism he makes the same references. I have not thought it necessary to make any alteration in what I have written in consequence of this coincidence.

† Masson's "Recent British Philosophy," 41.

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whatever objects they compose), cannot exist otherwise than in the mind perceiving them." So far for the first step. Now let us take another great step and go on to paragraph VI. "All the choir of heaven and furniture of earth, in a word, all those bodies which compose the mighty frame of the world, have not any substance without a mind, that their being is to be perceived or known, and that consequently so long as they are not perceived by me, or do not exist in any mind or that of any other created spirit, they must have no existence at all, or else"—now here we must take the next step, and when we have accomplished that we shall have landed ourselves on the platform upon which is built the whole philosophical structure of the "Sartor Resartus,"—"or else subsist in the mind of some eternal spirit: it being perfectly unintelligible and involving all the absurdity of abstraction to attribute to any single part of them an existence independent of a spirit." Do not let any one imagine that I wish to suggest that Carlyle took his Idealism from Berkeley. In all probability he got it from some German, who derived it by legitimate philosophical descent from the great English Idealist. I have appealed to the Bishop solely to get me out of the difficultly of explaining what Idealism really is. His Idealism seems to me to sufficiently resemble that of Carlyle to warrant me in using his words of admirable explanation.

We have here, then, the root idea of the "Sartor Resartus." On almost every page of it we shall find the proposition laid down that "all matter is spirit." The book contains little more than the working out of the conclusions which follow from this premise. Calling this to mind, that we all are spirits and that all that we know and see and feel is sustained and rests upon that Great Spirit who creates and animates all, we may then understand what Göethe meant when he made the Earth Spirit speak of the Universe as the Garment of the Almighty, the sign by which we recognize Him, and the outer covering by which he is at once revealed and concealed. We can scarcely read a page of the "Sartor Resartus" without meeting with some illustration or allusion to this idea. We encounter it at the opening of the book; in chapter IV. he refers to the peculiarity of the Professor "running through his whole system of thought of looking at all matter and all material things as spirit." In chapter XI. he speaks of "whatsoever sensibly exists, whatsoever represents spirit to spirit, is properly a clothing, a suit of raiment, put on for a season, and to be laid off." A page before this we have a few lines of concentrated wisdom on "the necessity and high worth of universal wonder. . . The man who cannot wonder, who does not habitually wonder (and worship), were he the President of innumerable Royal Societies, and carried the whole 'Mécanique Céleste and Hegel's Philosophy," the epitome of all laboratories and observatories, with their results, in his single head,—is but a pair of spectacles behind which there is no eye. Let those who have eyes look through him; then he may be useful." It is a great pity that Sir James Paget did not read this passage before he wrote his recent very learned but very narrow-

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minded address. Let me beg the students of ethical instinct to ponder the passage in chapter III., book III., where the Professor observes—"Yes, friends, not our Logical, Mensurative faculty, but our Imaginative one is King over us."

Finally, with reference to the question of Idealism, of course, some may say that it matters very little how the small number of those who discuss the questions of philosophy may be divided into Idealists and Realists. I cannot help thinking that it is a matter of great importance. We may suppose that the discussion interests but very few; you must have all observed how the conclusions of the few on such subjects are accepted by the many, and so go to make up that heap of assumptions and shrewd guesses and sentiments which together we call public opinion. In this way Carlyle and others have indirectly influenced thousands who have never read a line of their works or even heard their names. It has been said that we are all born either Idealists or Realists, and that as we are born so we go through the world. This may be so. The case of Dr. Johnson seems to favor this supposition. He was a man with a remarkably acute and robust intelligence, and yet he was evidently no more capable of understanding Berkeley than a man who is colour blind can distinguish red from green. If this is so it does not at all justify the Idealists in giving themselves airs of superiority. If it is granted for the sake of argument that they have the capacity for executing a species of mental gymnastic of which others may be incapable, may not the incapables vindicate their mental equality when the solution of some problems of a different order is demanded? Representative Idealists have more than once admitted that they are in a minority, and so it is unnecessary to urge upon them that it behoves them to go softly, still they must, I think, be pardoned if they exalt their horn thus far, and claim that whenever Idealism has prevailed there is evident in the literature of the period an originality, a creative effort, and an elevation which is lamentably absent when Realism is in the ascendant, and that in the treatment of great social and political questions the prevalence of Realism entails the attempt to solve them exclusively from the point of view of egoism and self-interest, and results in a national character, prosaic, and common-place.

What I humbly claim for Carlyle is this, that in an age given over to materialism and commonness, he, single-handed and alone, in poverty and obscurity raised his voice in protest against a degrading system of ethics, a low-minded collection of social and political ideas, and a sordid and prosperous vulgarity. He not only pointed out the disease of the body politic, but he proclaimed the true remedy. If literature has now a healthier tone and appeals to higher feelings than it did fifty years ago, I submit that much of this improvement is owing to the works of a school of which Carlyle is a distinguished ornament.

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THE TEETH IN THE ORDER "RODENTIA."

By W. A. Vice, M.B. (Read before Section "E.")

The "Rodentia," or gnawing animals, form a well-marked "Order," represented, in most parts of the world, by numerous species, which are of small size, the largest existing "Rodent" being the Capybara of South America. Other representatives are the Beaver, Porcupines, Squirrels, Hares and Rabbits, Rats, Mice and Voles. In Madagascar and Australia, where the Order is scarcely represented by indigenous species, individual species of other Orders mimic the Rodent type of dentition; in the former island, the Cheiromys, or Aye-Aye, and in Australia the Wombat.

The most marked peculiarity of the dentition, and that which gives the distinguishing characteristic to the type, is the presence of the large chisel-shaped incisors, placed two in the upper and two in the lower jaw. A considerable space intervenes between these incisors and the molars, which vary in character and number in the different families. There are no canines or pre-molars.

The incisors are referred to as chisel-shaped, and this form and character is produced by the peculiar disposition of the component parts of the tooth. The anterior surface only is covered with enamel, and this being so much harder than dentine, resists the wear and tear to which the teeth are subjected much better, and forms a very keen edge. Not only this, but the dentine itself varies in density; that portion anterior to the pulp-canal, and therefore nearest to the enamel, is of greater solidity than the portion posterior to the pulp. The teeth extend a long distance into the jaws; especially is this so with the lower incisors, which in certain families, as the Rats and the Porcupines, reach as far back or even further than the posterior molar tooth.

It is peculiar-shaped teeth which enable the Beaver to cut down trees for the construction of its dams, and by which Rats and Mice can so quickly gnaw through various substances, and the Squirrels obtain the kernels from the thickest shelled nuts. This work, however, is very hard upon the teeth, wearing them down quickly; and in a short time the teeth would be of no use for these purposes, but for the provision that, as they wear away, the tooth is protruded forward by increase of length in the jaw; the tooth is furnished with what is called a per-

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sistent pulp; in fact, the tooth simply consists of a greatly prolonged and ever-forming crown. In examining one of these teeth in the dry state, it is found that the end which is within the jaw is hollow, the surrounding tooth-structure being very thin and delicate. Proceeding towards the tip of the tooth, the hollow space is found to be contracted, by the thickening of the dentine. This hollow in a fresh tooth is filled by the pulp which gradually forms the tooth substance; the tooth and the pulp which is forming it being carried forward by growth at the base. It is the effect of this persistent growing, without the compensating wearing away, which produces the elongated teeth of Rabbits and Rats, etc., which we not unfrequently see or hear about. These deformities are caused either by some damage to the jaw, by which one or more teeth are not in their proper position, or by the loss of the opposing tooth; in either case the wearing away is prevented. The upper teeth are formed in the arc of such a small circle that the point very soon pierces the upper jaw; in some cases the tooth being killed by the cutting edge entering the pulp cavity, and destroying the pulp. The lower incisors form a much smaller arc of a greater circle; and it is these teeth that frequently grow to a great length when having no opponents.

In the Hares and Rabbits "Leporidæ," two extra incisors occur, situated immediately posterior to the large teeth of the upper jaw. These have persistent pulp, but are small and short, and seem to be nearly functionless.

The Hares and Rabbits, the Capybara, and some others, have the large upper incisors marked by a longitudinal groove down the centre of the anterior surface. Other species, as the Beaver, Rats, Mice, and Water Voles, and many more, have the enamel of these incisors coloured yellow or orange. It has been stated that the molars vary much in structure; and these modifications include many similar forms to those seen in herbivorous and omnivorous animals.

The molar teeth or grinders vary considerably both in number and character. The Hares have six above and five below, which is signified in the following manner:—$\frac{6}{5}$; the Porcupines have $\frac{4}{4}$, the Mouse family usually $\frac{3}{3}$, the Australian Water Rat (Hydromys) being reduced to $\frac{2}{2}$.

The total number of teeth most frequently occurring amongst the "Rodentia" is 20: $\frac{4\text{ m.}-1\text{ i.}\,|\,\text{i.}\,1-\text{m.}\,4}{4-1\,|\,1-4}$, signifying four molars, and one incisor on each side of either jaw. Hares and Rabbits are furnished with 28: $\frac{6\text{ m.}-2\text{ i.}\,|\,\text{i.}\,2-\text{m.}\,6}{5-1\,|\,1-5}$; whilst "Hydromys" has only 12: $\frac{2\text{ m.}-1\text{ i.}\,|\,\text{i.}\,1-\text{m.}\,2}{2-1\,|\,1-2}$, the typical number of teeth in the Mammalia being 44: $\frac{\text{i.}\,3-\text{c.}\,1-\text{p.m.}\,4-\text{m.}\,3}{3-1-4-3}$. This number is much more frequently seen in the extinct genera, especially amongst the *Ungulata*.

In the Rats, these teeth are very much like minute specimens of the teeth of the Quadrumana or those of man. Being principally composed

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of dentine, having well-formed roots, the crown having well-defined cusps covered with enamel, these teeth are not adapted for much wear. In old animals the cusps are found completely worn down; a simple surface of dentine, surrounded by a thin shell of enamel, having to perform the grinding process.

In the Hares and Rabbits, the molar teeth are formed essentially like to the incisors; that is, the anterior surface only is covered with enamel, thinning off at the sides, the posterior portion of the tooth being entirely of dentine. These molars have flattened anterior and posterior surfaces, the sides being grooved. There are no cusps, nor do they protrude far beyond the gum tissue. Each tooth consists of a portion of dentine surrounding the pulp, which is persistent like to the incisors. On the anterior face of this dentine is a plate of enamel; in the young the separate teeth, of which there are six above and five below, are united together by intervening layers of periosteum, which in the old animal gives place to dense bone. The teeth are slightly curved, so that pressure on the persistent pulp is avoided, and they converge toward each other at the grinding surface, in such a way that the bone between them, which is considerable at the lower part, thins out until the teeth touch at the upper, the grinding extremities.

The species which have this arrangement of dentine and enamel plates, have, as a rule, much freer lateral movement of the jaw than is found in others, and the plates of enamel working upon the softer dentine of the opposing teeth, wear grooves across the surface of the teeth, thus keeping an excellent triturating surface.

In the Capybara, where we find four molars on each side, three are small, but the fourth is a large one, consisting of a number, twelve or more, masses of dentine, completely surrounded by enamel, each produced from a separate persistent pulp, but fused together by cementum; the result being a complex tooth, producing a surface which use will continually keep in a good condition for grinding.

Various intermediate forms of molars occur, some in which the pulp continues for a considerable portion of the animal's life, after which roots are formed and the tooth completed.

Reference has been made to the fact that individual species in two far diverging Orders have developed a dentition, which mimics the Rodent type, the *Aye-Aye* and the *Wombat*; yet with much similarity they retain characteristics totally unlike the true Rodents. Especially is this seen when the milk-teeth are examined.

The nearest allies to the Rodents at the present time are the Proboscideans, though they are as remarkable for their great size as the Rodents are for their comparative smallness. The affinity in the dentition consists in the two incisors (the tusks of the Elephant) growing from persistent pulps, the absence of canines, the premolars and true

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molars being three upon each side. There is considerable similarity between the tooth of the Elephant and that of the Capybara, but the separation of the pulp is not complete in the Elephant, neither is it persistent, small roots being formed.

Professor Marsh has found, among the numerous fossil remains discovered in America, forms which seem to combine several very distinct existing groups, as the *Carnivora*, *Ungulata*, and the *Rodentia*. In the *Tillotherium*, the teeth being of the ungulate type, the canines are small, but a pair of large scalpriform incisors existed in each jaw, covered on the anterior only with enamel, and having persistent pulps. There was a second incisor, very small and not having a persistent pulp. In another family, the molars also grew from persistent pulps. One genus, of which the lower jaw only has been discovered, is described as having six incisors, two pair small and cylindrical, the outer pair of enormous size; enamel only upon the front surface, with persistent pulps carried far back under the pre-molars.

For the facts contained in this slight sketch, I am indebted to Huxley's "Anatomy of the Vertebrates," Tome's "Dental Anatomy," and to papers upon "The Dentition of the Rabbit," by Dr. Abbot, in the "Dental Cosmos."

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THE NATIVE TREES OF LEICESTERSHIRE.

By F. T. Mott, F.R.G.S. (Read before Section "D," *April 18, 1888.*)

The generally accepted distinction between a Tree and a Shrub is that while a tree has a single woody trunk, and attains at full maturity a height of 20 feet and upwards, a shrub has several woody stems rising in a cluster from the crown of the root, and does not, even at maturity, attain a height of 20 feet. This line of demarcation is not, however, a truly natural one. The distinction is convenient, but arbitrary. Some trees, as the Yew, Hawthorn and Elder, are often shrubs in their earlier years, throwing up a cluster of small stems, but become true trees in old age, when the separate stems unite into one.

Of the known species of plants, about one per cent. are trees, while about three per cent. are shrubs. Confining ourselves to those which come fairly within the definition of a Tree, we find that there are, described as British in Hooker's "Student's Flora," about 40 species, indigenous or naturalized; and the whole of these, with the exception of four, are included in the "Flora of Leicestershire." These four are the White-beam, the Medlar, the Abele and the Juniper, which are never found in this County except as distinctly planted and cultivated trees. The Medlar and the Juniper rarely attain the dimensions of a tree, but examples are known to exist which exceed 20 feet in height. Of the species included in the "Flora of Leicestershire," 28 have more or less claims to be regarded as indigenous, and in considering the true *facies* of nature in this small fraction of the earth's surface, it is only to those organic forms which have found here a natural home that we should pay any regard.

Our list of Native Trees (and several even of these are doubtful) will consist, then, of the following species only:—

Tilia parvifolia - - -	The Small-leaved Lime.
Ilex aquifolia - - -	The Holly.
Acer campestre - - -	The Maple.
Prunus Avium - - -	The Wild Cherry.
Pyrus communis - - -	The Wild Pear.
P. malus - - -	The Wild Apple.
P. aucuparia - - -	The Mountain Ash.
Cratægus oxyacantha - -	The Hawthorn.
Sambucus nigra - - -	The Elder.
Fraxinus excelsior - -	The Ash.
Ulmus montana - - -	The Wych Elm.
Betula alba - - - -	The Birch.

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ALNUS GLUTINOSA - - -	The Alder.
QUERCUS ROBUR - - -	The Oak.
FAGUS SYLVATICA - - -	The Beech.
CORYLUS AVELLANA - - -	The Hazel.
CARPINUS BETULUS - - -	The Hornbeam.
POPULUS CANESCENS - -	The Grey Poplar.
P. TREMULA - - - -	The Aspen.
SALIX TRIANDRA - - -	The Almond-leaved Willow.
S. PENTANDRA - - -	The Bay-leaved Willow.
S. FRAGILIS - - - -	The Crack Willow.
S. ALBA - - -	The White Willow.
S. RUSSELLIANA - - -	The Bedford Willow.
S. CAPREA - - -	The Goat Willow or Sallow.
S. VIMINALIS - - -	The Osier.
PINUS SYLVESTRIS - - -	The Scotch Fir.
TAXUS BACCATA - - -	The Yew.

Of these, five belong to the Order *Rosaceæ*, six to the *Cupuliferæ*, nine to the *Salicineæ*, two to the *Coniferæ*, and the remaining six to as many separate Orders. Those of the most doubtful nativity are the Lime, Pear and Bay-leaved Willow. The common trees which are known not to be indigenous are the Horse Chesnut, Sweet Chesnut, common Elm, Sycamore, Walnut, Spruce Fir, and Larch.

This group of native trees has nothing about it very special or peculiar. The whole of the 28 species belong to the general Flora of Central Europe, and are no doubt the lineal descendants of trees which formed the European forests of the Pliocene or latest Tertiary epoch.

At the commencement of the Tertiary period, the climate of Europe was almost tropical, and the forests consisted of Palms, Figs, Custard-Apples, Laurels, Acacias, and the tenderer Conifers. In the middle Tertiary, or Miocene times, the Palms and Custard-Apples had disappeared, the climate was only sub-tropical, and mixed with the Figs and Laurels were Oaks, Beeches, Willows, and some hardier Conifers; while in the latest, or Pliocene period, which preceded the invasion of the Northern ice-sheet, the mean temperature had gone down to something like that of the present day, and the forests consisted chiefly of the broad-leaved Amentiferæ below, with Coniferæ on the mountain slopes. Then came the great icy deluge, slowly creeping southwards, in Britain as far as the Thames, in Central Europe to the 50th parallel, where it must have been almost met by the glaciers of the Alps and Carpathians, utterly destroying all forest life and bringing down into the southern Flora a crowd of Arctic types. This Arctic vegetation, however, included but few trees, and when the warmer cycle returned and the snow and ice had melted off, Europe became once more a region of forests, similar in general features to those of the Pliocene times, but with the specific forms modified, and with a small mixture of Arctic types left by the glaciers and of southern types brought back from the Mediterranean region.

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Leicestershire was entirely covered by the ice-sheet, and had to be re-peopled with animal and vegetable life when the soil was once more exposed. Probably England was still at that time connected with the European Continent, so that the trees which gradually took possession of our plains would be the same as those of Germany and Northern France. Those which belong to more northern types, and may have been introduced by the glacial ice, are the Birch, the Bay-leaved Willow, and the Scotch Pine; while the wild Pear may have been brought back from Southern Europe. It is a little remarkable that so few species of *Coniferæ* are now found wild in Great Britain. Out of some two dozen species indigenous in Europe, three only are included in the British Flora, and but two of these are found in Leicestershire. The Juniper, though a native of most parts of England, especially on chalk or limestone hills, has never been recorded in this County. It appears that, with the return of the forests, several other species came to these Islands. Cones of the Spruce, the Stone Pine, and the Silver Fir have been found in Irish bogs and elsewhere; but, for some unknown reason, these have become extinct, and though they are largely planted they do not seem to naturalize themselves or to stray away from the cultivated plantations.

Among the whole 28 of our native trees, only six bear conspicuous flowers, and five of these belong to the Order *Rosaceæ*; the sixth being the Elder. The proportion in the Tree Flora of the world is about three-fourths with showy flowers to one-fourth with inconspicuous corollas or none; so that England is much behind the world in general in its proportion of flowering trees. A considerable number of flower-bearing genera have been found in the Tertiary beds, especially in Switzerland and in North America, though I believe not many in Britain. There can be no doubt that the development of brilliant corollas is one of the latest phases of vegetable life. It may be that in Europe the home of the flowering trees is on the Mediterranean Coast; that after the Glacial Epoch the returning Flora brought only a few of the hardiest of these forms at first, and that the land connection with the British Isles was severed before any others had made their way across.

It is notable that our six flower-bearing trees belong to two Orders, *Rosaceæ* and *Caprifoliaceæ*, which contain, among their numerous species, some which are trees, some shrubs, and some herbs; while the remaining 22, with inconspicuous flowers, belong to Orders which are exclusively trees and shrubs—unless, indeed, the Elm be included among the nettles, from which it has been separated by some of the best authorities. This fact seems to indicate some peculiar relation between Herbs and Trees. In what direction is this to be looked for? I have frequently pointed out what seem to me to be the four secondary waves in the development of every primary wave of organic life, viz.: the cellular, the osseous, the fibrous, and the nervous, which are represented in the vegetable kingdom by the soft parenchyma, the hard stem and branch system, the fibrous and laminated foliage, and the sensitive blossom; and shown how these succeed each other always in the same order. The first beginnings of

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vegetable life on this Globe were no doubt purely cellular, soft cryptogamic algæ, at first small separate cells, afterwards larger masses of united cells. As the second wave rose into prominence, the woody system was developed in tree ferns and arborescent Lycopods; and in later epochs, with the rise of the foliage wave, these Lycopods developed into Conifers, and then into leafy Amentiferæ. The next and latest step would be the development of the blossom and the decrease of the cellular and woody systems as these waves passed their climacterics and entered their descending phases. Small flowering trees and flowering shrubs would thus be the crowning glory of vegetable life. But if any conditions were encountered which tended to hinder or prematurely to stop the progress of the second wave, diverting its energy into the current of the third and fourth waves, these would be precociously developed, while the second wave would be eliminated. The result would be the production of excessive foliage and blossom at a period even earlier than their development on the more normal trees and shrubs, and this would account for the leafy and flowering herbs of the present day, whose excessive number—probably not less than 50,000 species, while the flowering trees and shrubs do not exceed 4,000—would seem to indicate that this suppression of the woody stem and branch system must have taken place on a large scale. Possibly it may have been caused by the destructive and depressing action of the Glacial Epoch.

In the Tertiary strata are found representatives of nearly all our trees with inconspicuous flowers, also sedges and grasses; but flowering herbs are rare. These seem to have been quite a recent introduction. The majority of our native trees, therefore, may be regarded as survivals of a past geological era, while flowering herbs are the special characteristic of the present, or Quaternary period. Our few flowering trees, which are all of comparatively small size, represent the normal current of the organic wave, in which the cellular and osseous secondary waves have passed their climacteric and are waning, but not yet by any means extinct, while the third, the fibrous or foliage wave, is perhaps just about at its height, and the last, the nervous or blossom wave, is coming rapidly into prominence. The age of gigantic trees, 400 feet high and 30 feet diameter, has already passed away, a few relics alone remaining in sequestered corners of the world. The future of tree-life will tend towards diminished size, more abundant blossom, and more brilliantly coloured corollas. Our forests will be less imposing, but far more beautiful. Our Elms, and Willows, and Beeches, even our famous British Oak, are all behind the age and are dying out, to be succeeded first by a crowd of smaller species bearing large white flowers, like our present Pears, Apples, Cherries, and Hawthorns, and finally by others, perhaps still smaller, but rich with the bright secondary hues—scarlet, crimson, purple, gold, orange, and blue, and marking every month from Spring to Autumn, with some brilliant change of tone, some fresh turn of Nature's magnificent kaleidoscope.

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Quarterly Reports of Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Tuesday, March 20th, 1888.—In the absence of the CHAIRMAN of the Section, the Chair was taken by Mr. CHARLES J. BILLSON, M.A.

A Paper on "Sartor Resartus" was read by Mr. J. D. PAUL, F.G.S., and will be found at page 8 of this number of the Transactions.

A discussion upon the Paper followed, in which Messrs. BILLSON, DAWSON and SIMPSON took part.

Mr. A. H. PAGET was elected Chairman and Mr. J. SCAMPTON was re-elected Secretary for the ensuing year.

WM. JACKSON, *Chairman.*

SECTION "C."

FOR GEOLOGY.

May 10th.—A Discussion was held on "The origin of Coral Reefs," in which Mr. PAUL and Mr. BROWN took part.

A Meeting has since been held, at which LOUIS HODGES, St. Martin's Schools, was appointed Secretary for the ensuing year, and the CHAIRMAN was re-elected.

Mr. A. H. PAGET was elected Chairman, and Mr. J. SCAMPTON was re-elected Secretary for the ensuing year.

Below is a short abstract of Mr. J. D. PAUL'S paper on "The Geology of the neighbourhood of Gilsland."

The paper was a slight account of such objects of geological interest as came under the writer's observation during a fortnight's stay at Gilsland, in the Waverley country, on the borders of Northumberland and Cumberland. The structure of the Cheviots was described, with their core of Silurian rocks which was very early raised and contorted, and next covered by a volcanic outburst of Syenites and other ejectamenta. Both in material and in their method of deposit there is a close resemblance to what we find in the rocks of Charnwood Forest. An explanation followed of the physical geology of Northumberland from the Cheviots to the sea-coast, showing the Upper Old Red, the Tuedian, the Bernician, the Millstone Grit and the Coal Measures all pretty regularly imposed on

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each other. The local peculiarities of the Tuedians and Bernicians, and their relation to formations of the same age to the north and south of them, were explained. A short account was given of what may be seen by a superficial observer in the Alston lead mining district in the south of Northumberland, and the different theories propounded in explanation of the formation of mineral veins, were discussed. The great importance was pointed out of the deposits, containing salt and gypsum, which were laid down in the inland Permian and Triassic seas. Attention was drawn to the upheaval of the Great Whin Sill and the resemblance of the rock to the basalts of Whitwick and Rowley Regis. The regular succession of the formations one after the other, between the Cheviots and the east coast, was contrasted with the enormous break which occurs on the Cumberland side, where the Brampton Gault brings the Permian down to the level of the Lower Carboniferous. The very striking outlier of Lias close to Carlisle was noticed. The Tertiary Dykes, the lessons afforded by the moorlands and the Triassic country in denudation, the persistence of Roman incriptions and the existence of Eskers, were all remarked upon.

C. A. MOORE, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

March 21st.—Nine members present.

Exhibits.—Mr. CARTER, Twigs from various native trees, to show the progress of vegetation.

Mr. MOTT, F.R.G.S., a copy of "Parkinson's *Paradisus Terrestris*, 1629," with colored plates, and a fine collection of dried plants from Belvoir gardens, including specimens of *Protœa*, *Urtica pilulifera*, *Chionodoxa Lucilla*, *Scilla*, *Smilax*, &c.

The CHAIRMAN read a short paper on "The Migration of Birds." He pointed out the extraordinary powers of flight possessed by many birds, and brought forward instances observed by himself, when crossing the Atlantic, of two land birds alighting on the ship when 1000 miles distant from land. He then alluded to the migration of birds generally, and said that their flight always took place by night and at certain definite times of the year, and that the mouths and estuaries of rivers were favourite spots for birds to settle upon on their arrival in a fresh country. He also alluded to the systematic observations which are now being made by lighthouse keepers and others, and anticipated a great increase on our present scanty knowledge of the Migration of Birds, by means of those and similar observations over extended periods.

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April 18th.—Six members present.

Exhibits.—Mr. TURNER, "Fitch's Illustrations of the British Flora."

Mr. F. T. MOTT, "Loudon's *Arboretum et Fruticetum Britannicum*," containing illustrations of famous trees.

Mr. MOTT read a paper on "The Native trees of Leicestershire." (Printed at page 20).

May 16th.—Seven members present.

Mr. F. T. MOTT, F.R.G.S., Birstal Hill, Leicester, was elected Chairman for the ensuing year, and Mr. J. W. KNOWLES, 3, St. Stephen's Road, Leicester, was elected Secretary.

The excursion to Narborough Bogs took place on May 9th, but nothing of special interest was recorded as being found by those present, except the rather uncommon fungus *Morchella semilibera.*

Exhibits.—Mr. E. F. COOPER, Seeds of *Sorghum saccharatum*, an Italian grass, recommended to be used as food for cattle in England.

Rev. T. A. PRESTON, mounted specimens of destructive Insects, showing their metamorphosis and the kind of vegetable food they live upon. The specimens included Daddy Longlegs, Bean Aphis and Currant Moth.

Mr. E. F. COOPER, F.L.S., read a paper on "Cheirognomy," in which he described the seven different forms of hand which are recognised by students of the science, and exhibited diagrams to illustrate the different forms, and at the same time described the various characteristics of mind and character which are said to be found in connection with the varying shapes of the hand in the human race.

HY. TOMKINS, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

March 12th.—The CHAIRMAN read a paper entitled "Some points in the structure and development of the teeth in the *Rodentia.*" (Printed at page 16).

Objects exhibited.—Skulls and sections of ditto, showing teeth *in situ*, of Rabbit, Rat, Vole, &c., by the CHAIRMAN.

Skulls of *Capybara* and *Paca*, by Mr. MONTAGU BROWNE, F.Z.S.

Physiological Micro Slides, by the SECRETARY.

April 9th.—A paper was read by Mr. G. H. STORER, "Notes on the Natural History of the Natterjack Toad *(Bufo calamita).*"

After referring to its local distribution in Britain, Mr. STORER stated that it was at Southport, in Lancashire, he first made the acquaintance

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of this species, which is exceedingly plentiful among the sandhills on the coast. These sandhills, formed by the wind driving together the shifting sands, too loose to afford foothold, except to such deep-rooted plants as the Sea Holly *(Eryngium maritimum)*, Sea Spurge, and various creeping grasses, were the haunts of a colony of Grayling Butterflies *(Hipparchia semele)*, Sand Lizards, and, here and there, each seated at the mouth of its little burrow, and exposed to the full power of an August sun, were numerous Natterjacks. Unlike most Batrachians, to whom lack of moisture and shelter is fatal, the Natterjack seems to revel in the heat. In marshy pools at the foot of the sandhills, the larvæ of this Toad were found in great abundance, many of them being very small, even so late as the second week of August. The rapid pace of the Natterjack when in motion (reminding the observer of Mice), as opposed to the slow and lethargic movements of the common Toad, as they endeavour to reach their holes, their activity and loud croaking at night, their fecundity, and peculiarity of the ova, together with other points in their life-history were carefully described.

Objects exhibited.—Spirit specimens of the Natterjack Toad *(Bufo calamita)*, from Southport, by Mr. G. H. STORER.

Fine specimen of *Chœrocampa elpenor*, bred from a larva taken in Syston Street, Leicester, 23rd August, 1887, and male and female of *Smerinthus ocellatus*, bred from larvæ taken at Aylestone and Queniborough during the past season, by the SECRETARY.

May 28th.—The May meeting which was originally arranged to take place on the 7th was unavoidably postponed, and Mr. MONTAGU BROWNE'S paper was, therefore, deferred until the 11th June.

The meeting was, under the circumstances, a purely business one for the election of Officers, presentation of Annual Report, &c.

It was unanimously resolved that Dr. F. M. POPE be elected Chairman for the ensuing year, and the present Secretary was at the same time re-elected.

A hearty vote of thanks to the retiring Chairman (Mr. W. A. VICE, M.B.), and to the SECRETARY, for their services to the Section during the past Session, terminated the proceedings.

W. A. VICE, *Chairman.*

NOTICE.

A paper read before Section "E" by Mr. MONTAGU BROWNE, F.Z.S., upon his recent discoveries of weapons and implements of *Palæolithic* Man in Leicestershire, will be published in the October number of the Transactions, and be illustrated by several plates.

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Announcements.

GENERAL MEETINGS.

1888.
Wednesday, July 11.—Excursion to Charnwood Forest.
Monday Oct. 8.—President's Inaugural Address.

SECTIONAL MEETINGS.

SECTION "D."

(ZOOLOGY AND BOTANY).

Chairman—Mr. F. T. MOTT, F.R.G.S., Birstal Hill, Leicester.

Secretary—Mr. J. W. KNOWLES, 3, St. Stephen's Road, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

FIELD DAYS—The second Wednesday afternoon in each month.

PROGRAMME.

EVENING MEETINGS.

July 18.—1. Suggestions for measuring the growth of Plants.
2. Exhibition of cut garden flowers, with their foliage.
3. Paper by the CHAIRMAN on "*The results of Cultivation.*"

Aug. —No Meeting.

Sept. 19.—1. Reports of measurements of plant growth.
2. Exhibition of Seed-vessels of various plants.
3. Paper by MR. THOMAS CARTER, LL.B., on "*The Phanerogamic Parasitic Plants indigenous to Leicestershire.*"

FIELD DAYS.

July 11.—The Excursion of the Society to Gracedieu, &c.

Aug. —No Excursion.

Sept. 11.—Excursion to Great Stretton, on the Gartree Road.

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—F. M. POPE, M.D., Campbell Street.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

July 2.—Paper by Mr. H. E. QUILTER, M.C.S. on "*Monophyletic and Polyphyletic Descent.*" A short statement will be made by Mr. MONTAGU BROWNE, F.Z.S., on his recent discoveries of *Palæolithic* Implements in Leicestershire, illustrated by several hundred specimens.

Aug. —No Meeting.

Sept. 10.—Paper by Mr. MONTAGU BROWNE, F.Z.S. on "*Palæolithic Man in Leicestershire.*"

The paper for the Evening will be read at 7.45 ; any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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Vice-Presidents:

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F. T. MOTT, F.R.G.S.
A. H. PAGET.
GEORGE STEVENSON.

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E. F. COOPER, F.L.S.	C. W. COOPER, M.B.
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Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
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E. CLEPHAN. T. C. LEE.

Four Co-optative Members of the Museum Committee of the Town Council, recommended by the Society.

H. BILLSON. | A. H. PAGET.
E. F. COOPER, F.L.S. | J. D. PAUL, F.G.S.

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A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,
Chairman, A. H. PAGET.
Secretary, JNO. SCAMPTON.
1, Pelham Street.

C. GEOLOGY,
Chairman, C. A. MOORE, M.D.
Secretary, LOUIS HODGES,
St. Martin's Schools.

D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, F. T. MOTT, F.R.G.S.
Secretary, J. J. W. KNOWLES,
St. Stephen's Road.

E. ZOOLOGY,
Chairman, F. M. POPE, M.D.
Secretary, F. R. ROWLEY.
Town Museum.

Number of Members, 1887-88.

Subscribing 271, Associates 25, Honorary 22.—Total 318.

General Meetings.

Fortnightly, on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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EVIDENCES OF THE ANTIQUITY OF MAN IN LEICESTERSHIRE.

By MONTAGU BROWNE, F.Z.S., Curator, Town Museum, Leicester.
(Read before Section "E.")

WHEN I read my first Paper—"Some Notes upon the Remains of *Cervidæ* found in Leicestershire"—before Section "E" of the Leicester Literary and Philosophical Society, on the 11th June, 1888, I incorporated with it some facts and generalizations bearing upon the antiquity of Man in the County, as evinced by the state of the remains of *Cervidæ* and other *Ungulates* which I had, from time to time, discovered in various excavations which my duties and inclinations had led me to examine. Since this Paper was read, however, I have been invited to extend my horizon, and give a *resumé* of the state of local knowledge in this direction down to the present day. To that end the Literary Society has, with much generosity, accorded me the requisite space—which I fear is somewhat excessive—and has also arranged for the production of the valuable plates which accompany this Paper. Probably it may be expedient to divide my work into two epochs of unknown time, conveniently, because vaguely, termed, the "Palæolithic" and the "Neolithic" Ages; and I may briefly remark that—

(1) The Palæolithic, or Old Stone Age, deals with the productions of Man from the earliest times in which we can trace his handiwork by the light of the sparks thrown off from the flints which formed his first tools and weapons,—implements of such extraordinary antiquity, that the mind fails to grasp the ages which have elapsed, since savage Man fashioned these implements, and roamed the wilds of those lands we now call Britain. Certain it is that some of his work exists in flints, worked and chipped with laborious care during Inter-glacial, and it may be even in Pre-glacial, times. What this latter would mean, if proved, is best elucidated by Dr. Croll, who estimates, from mathematical data, that the change in the eccentricity of the earth's orbit which caused what we call the Glacial Period lasted about 160,000 years, down to within 80,000 years of the present time, placing the commencement of the period of extreme cold to 240,000 years ago. This would argue, therefore, an antiquity, for any Pre-glacial flint implement, of at least 300,000 years! Professor Prestwich, however, in an elaborate article in the "Quarterly Journal of the Geological Society," 1887, pp. 393-408, is not disposed to accord such an extreme antiquity as this, and would give Pre-glacial Man no greater age than, at the utmost, 30,000 years, and Post-glacial Man is so youthful as to

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have but 15,000 years antiquity accorded him, *before the advent of Neolithic Man*, this latter at present being an unknown quantity, which is perhaps the weakest part—because not yet accounted for by mathematical or geological conclusions—of Professor Prestwich's argument. The discussion which followed this memorable Paper, and the subsequent articles, prove that many of the best geologists are by no means in accord with the theories shortening the duration of Man's existence upon the Globe; and at present the matter rests upon the assumption that (1) the Pre-glacial Period may be estimated as earlier than 240,000 years ago, or (2) as being 30,000 years plus the advent of Neolithic Man, which, as I stated above, is an unknown quantity.

This brings us to the second stage, the Neolithic or New Stone Age, in which the weapons are still of flint or stone, and, if not polished in whole or in part, are often elaborately flaked, shaped, or ornamented. Of necessity, this unknown period before the Historic overruns the ages of bronze and iron of late Neolithic, or Pre-historic, or even of Historic times, and therefore it is not unusual to find flint weapons of the late Neolithic Period associated with bronze weapons of the same date, or of even earlier times, due probably to the mingling of tribes in different stages of development.

In questions dealing with periods of unascertained duration, it will be found the most convenient to work backward from the early Historic, and this method I propose to adopt in these pages, and, by giving a short description of the various objects found in the County, to gradually arrive at some distinct notion of the antiquity of Man therein.

DIVISION I.—BONE, AND HORN.

I will, for reasons subsequently given, place first articles made from the bones of various animals, and next describe Deer-antlers of some age, which have been found *cut*, or from which tools or weapons have been made.

The first mention I find of these articles is in the "Proceedings of the Society of Antiquaries," 22nd November, 1860, where the late Mr. James Thompson, of Leicester, communicated, through the late Mr. J. G. Nichols, F.S.A., the discovery of a wattled well in Butt Close Lane, whose approximate dimensions were as follow:—"Height, 5 feet 6; length at bottom, 5 feet 6; at top, 7 feet 6; width at bottom, 3 feet 6; at top, 5 feet 6. The general appearance will be best shown by the drawing and section accompanying these observations. When first seen, the framework was quite discernible in all its details. It was ingeniously constructed of 22 stakes from 1½ to 2 inches in diameter, round which hazel sticks about ¾ inch in diameter were entwined. The portions were all saturated with moisture and of the natural size; but on exposure they became dry, shrank, and speedily perished, though some fragments have been preserved.

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"The wicker-work had all been woven round the upright stems with the bark on, and this, by swelling on being saturated with the water, had settled into a compact fabric, impervious to the water within or without. Great pains had been taken to prevent the sides being crushed in, by placing ten larger stakes, from 4 to 5 inches in diameter, at intervals on the inner part of the basket, and by putting stones round the inner rim at the bottom, which was formed by the gravel itself through which the water rose. This curious object was found about 14 feet below the present surface of the ground (measuring from the rim to the surface), embedded in the undisturbed gravel, or virgin soil. About 2 feet above the rim of the basket were visible indications of a ground line. On this line were found, the lower portion of a flint celt 4 inches long, and various articles rudely fashioned out of bone. Among these was a circular ornament, pierced with holes; a tube, apparently a whistle; and other things, the more curious of which are represented in the accompanying illustrations.

"The basket itself was found completely choked up with rubbish. At the top were chiefly large pieces of unshapen stone; lower down, fragments of the horns of the elk or deer, the teeth of various animals, the tusks of the boar, a large wedge of stone, portions of the skulls of two goats, two whetstones, two pointed pieces of corroded iron, and other things; and at the lowest part was found a mass of materials composed of chickweed, rushes, hay, and snail shells, blanched with age. Such would seem to have been the contents of the basket on its ceasing to serve its original purpose.

"Four feet above the line in which the celt, the bone whistle, and other articles of bone were found, another level was observable. On this a pair of Roman shears, a rude crucible, and other things of the same date were met with, clearly the relics of a later age than the articles of stone and bone over which a layer of earth, four feet in thickness, had had time to accumulate. This level was, of course, six feet above the mouth of the basket. It is rather remarkable that about four feet above this last level is traceable another, in which fragments of Roman pottery, small and coarse, are found, and four feet above this is the present surface. On the supposed Roman levels streaks of charred material, making black lines thick in the middle, and thin toward the edges, were distinctly visible. In the upper crust of the bank small bits of pottery of Roman character are quite plentiful, and the earth is of a very mixed description. Thus far I have confined myself strictly to the facts furnished to me by Mr. H. Goddard, architect, of this town, who was present when the basket was first found, who carefully examined each successive discovery, and who has made the accurate and faithful drawings herewith forwarded. With him, I may also mention, I have closely examined the earth on the site in question, and as far as my observation extended I can fully confirm all his statements, did they need such confirmation. Had they stood alone, however, I should unreservedly have received them as correct, in perfect reliance on his matured judgment, his faithful description, and

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his antiquarian experience. Having, then, on such authority, detailed the facts, I take leave to give you my conjectures on the subject.

"When the basket was first deposited in the ground it was (as already stated) two feet below the level of the surrounding surface. It was evidently intended to serve as a tank for the collection of water for drinking purposes; and being seven feet six in length by five feet six across, and between five and six feet deep, its cubic contents were considerable. The simple material of which it was constructed, the depth below the present surface, and the discovery of the flint celt and the articles of bone on the bank, all point, I think, to an origin in a time long before the occupation of the site by the Romans, when the ancient Britons were the sole and undisturbed dwellers in the district."

Mr. A. W. Franks, M.A., F.R.S., &c., to whom they were submitted at the time, considered these articles, from their general appearance, and from their similarity to articles found with late Roman antiquities in the caves at Settle, in Yorkshire, to "belong to a late Roman, or even possibly to an early Saxon Period." Nearly all of these bone objects are figured in the article mentioned, but I have deemed it necessary to repeat some of them here.

On plate i., fig. *a*—described in the original as No. 7—is a perforated Boar's tusk, with another, shallow, hole in line, and, Mr. Franks thinks, may have been intended, when joined to a second, to be used as "a crescent-shaped ornament, such as were used by the Romans as horse-trappings."

Fig. *b*, which appears to have been split since it was figured, is described as—"5. A cylindrical object (3½ inches in length), with a wide oval slit; one very similar was found in the caves at Settle, and is engraved in *Collectanea Antiqua*, pl. xxx., fig. 2." Nothing appears to be known of its use, but I now hazard the conjecture that this may have been intended as one of the side bars of a horse's bit; and its comparison with fig. 1, plate ii., which *is* part of a horse's bit, warrants the supposition.

Fig. *c*, described as—"4. An object pierced in the centre 1⅞ inches long; it resembles somewhat a relic found with late Roman antiquities in the caves at Settle, in Yorkshire, and engraved in Roach Smith's *Collectanea Antiqua*, vol. i., pl. xxix., fig. 2, but which has zigzag ornaments upon it. Another, somewhat larger, was found in the same place."

Fig. *d*, described as—"6. A tooth, perhaps of a dog, 1½ inches long; it is pierced for suspension, and may be compared with one found at Settle (*Collectanea Antiqua*, pl. xxix., fig. 4). The use of such objects as personal ornaments, possibly as charms, is illustrated by the discoveries in Livonia (see Bähr, *Gräber der Liven*, pl. iii., ix., and x.)."

Fig. *e*, described as—"3. A whistle, 3¼ inches long."

Fig. *f*, described as—"1. A circular ring, 2¼ inches in diameter, and about $\frac{4}{10}$-inch wide; it is flat, roughly made, and pierced with three or more holes. An object very similar to this in every respect was found in 1829 at Newnham, in Northamptonshire, and is now in the collection of Sir Henry Dryden, Bart.; it has several holes in it, and, from its

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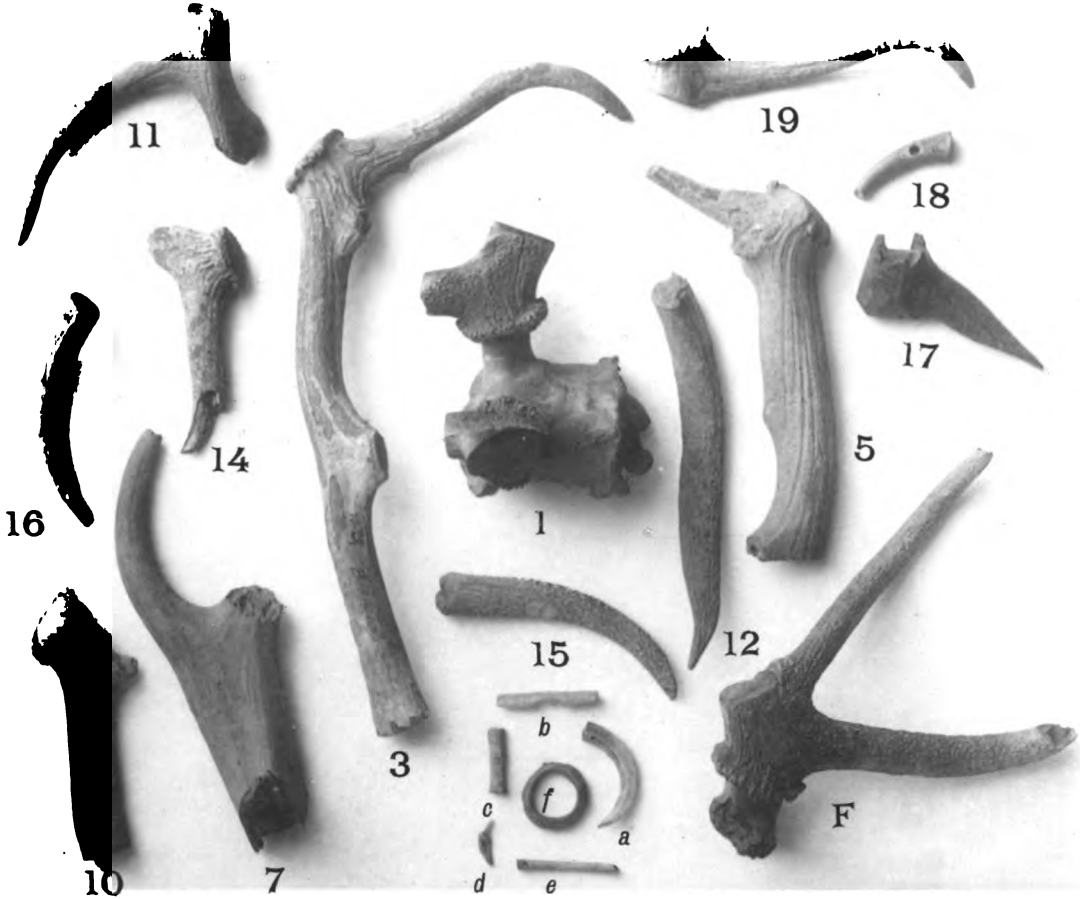

DIVISION I.—BONE, AND HORN.

PLATE I.

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green colour, has evidently long rested in close proximity to bronze." I may remark upon this last statement that it does not always follow that bones and skulls stained green are so from their contact with bronze or copper, as it is well known that other causes produce that effect.

It would seem almost like presumption on my part to say that further discoveries, and especially those at Barrow-on-Soar, hereafter described, may modify the views of those who hold that all the bone objects we have in the Leicester Museum are Roman. I think enough has not been made of the wattled well, which was, we know, in use by the Keltic peoples, nor of the flint celt, to say nothing of the distinct statement that, although Roman remains were found *above* the well, yet that none were found *within* it. The only things pointing to a late date are the two pieces of corroded iron, but objects even of this metal are known to be of late Keltic age. Dr. Jno. Evans, F.R.S., &c., at p. 130 of his splendid work upon "Ancient Stone Implements," refers to this discovery, and, at p. 131, commenting upon the association of stone celts in this and in other instances, writes:—"The association of these stone implements with Roman, and even post-Roman, remains, in so many different places, would at first sight appear to argue their contemporaneity; but in the case of the celts being found on the sites of Roman villas, two things are to be remarked: first, that sites once occupied may, and constantly do, continue in occupation for an indefinite length of time, so that the imperishable relics of one age, such as those in stone, may become mixed with those of a long subsequent date; and second, that had these stone implements been in common use in Roman times, their presence among Roman remains would have been the rule and not the exception, and we should have found them mentioned by Latin authors. Moreover, if their use had survived in this manner into Roman times, we should expect to find them still more abundantly associated with tools of the bronze age. We have, however, seen how rarely this class of stone instruments is found with bronze."

TOOLS, OR WEAPONS, FORMED FROM ANTLERS.

I find recorded in vol. v., p. 197, of the "Transactions of the Leicestershire Architectural and Archæological Society," the exhibition, by the late Mr. Weatherhead, 31st March, 1879, of some Roman bone pins, &c., with the following remarks:—"The five bone pins, &c., were found some years since (together with Roman Pottery) within the precincts of the Borough Gaol. Coupled with this find were several skull bones and antlers of the deer tribe (some cut and sawn), examples of which were also exhibited. These objects have evidently been manufactured from these bones, as can be readily traced upon examination. This fact not only enhances the interest attached to these objects, but appears to invest them with special interest, inasmuch as it tends to prove that these and such like articles (assigned to the Roman period) were frequently manufactured from the antlers of the

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Cervidæ, or deer family, such as the Stag or Red-deer *(Cervus elaphus)*, &c." Probably some cut antlers which I have lately acquired from the late Mr. Weatherhead's executors are some of the specimens mentioned above; if so, their condition, though dense, is not of the same character as the Barrow specimens (hereafter described), with the exception of No. 4. The sawing also of these specimens is totally unlike those from Barrow, having been cleanly cut with a fine saw. With these large embrowned, and dense antlers, there is a skull with the antlers cut off, of quite another type and condition, said to be from the same place, but, as the specimens are unlabelled, and as no depths were taken at which the Roman pottery, and at which the antlers were found, it would be useless pursuing the subject farther.

I find, in the same volume, p. 229, the exhibition, by Captain Whitby, on January 26, 1880, of "Part of a stag's horn, found in the Abbey Meadow, with a cut on one side of it." And at p. 345, it is recorded that, on the 15th June, 1881, some stag's antlers were found, at Mountsorrel Quarries, in a sepulchral chamber of the Roman Period, shewing saw marks, and on one marks made by a less perfect instrument.

On 15th July, 1886, I was permitted, by the kindness of Messrs. Ellis and Sons, to examine an excavation at Barrow-on-Soar. When I arrived, the men were at a depth of between 9 and 10 feet, having penetrated, at 4 feet from the top, through soil and reddish clay, into the lias limestone, and had evidently broken into a refuse pit, where they had found some fragments of Roman pottery and some mammalian, including a few human, remains. At 9 feet deep they had found an irregularly rounded pan of red earth, which, on being submitted by me to Mr. A. W. Franks, M.A., F.R.S., was pronounced by that eminent authority to be "Very queer. If certainly found on the spot, not older than Roman."

From this point I watched the excavation, and found this pit, of about 3 feet across, choked with skulls and horns of Hog, Sheep or Goat, Long-faced Ox *(Bos longifrons)*, and skulls and antlers of the Red Deer *(Cervus elaphus)*. At 11 feet deep occurred the skull with antlers cut off, No. 1, described below, and under that the tool or weapon, No. 17. At 12 feet deep the bottom of the pit appeared to have been reached. Although quite a quantity of small sticks were taken out, I could not satisfy myself if the pit or well had been wattled, or if these osier twigs were of accidental occurrence.

The following is the history of the specimens found:—

1.—Part of skull with large burrs—antlers *cut* off. Dense and heavy, of a dark-brown colour, semi-fossil, and evidently of great antiquity. Circumference above each burr, $8\frac{1}{8}$ inches. The beams of both antlers are cut off above brow-tines, as also the brow-tines themselves, both beams having been removed by two or three cuts with a rude, saw-like, instrument at a very remote date, and the right brow-tine, if not the others, has been struck after cutting, to detach it. Both beams and brow-tines are much rounded and

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worn smooth, with minute scratchings, on their superior inner edges. Probably the wearing is due to the passing of stones over their surfaces when the remainder of the skull was embedded in a water-course. (See plate i., fig. 1.)

2.—Part of skull, with antlers cut off *below* the burr. This, though dense, is not quite of the same character as the last, nor is it quite so embrowned. A rude, *thick*, saw-like instrument has been used to separate the beams. The cuts, however, appear to take the same direction, but are at different levels, and after going nearly through, the antlers have been struck in the usual manner to detach them.

3.—Shed left antler, with bez-tine and those above it cut off, the brow-tine only being left. Length of beam, 19 inches. Circumference above burr, $7\frac{1}{4}$ inches; between bez and tres-tines, 5 inches; where cut off, 6 inches. The bez-tine has been rudely cut at three attempts, and then struck to detach it. The tres-tine has been more smoothly cut off. The beam has been cut off above, probably at three attempts. Condition dense, but not very heavy. The greater part of the antler is encrusted with lime, and is evidently of considerable age. As only the brow-tine remains at the end of the trimmed beam, it is probable that this may have been used as a pick. (See plate i., fig. 3.)

4.—Shed right antler, with bez-tine cut off raggedly, tres-tine fractured, and also beam at 20 inches from burr. Circumference above burr, $6\frac{7}{8}$ inches; between bez and tres-tines, $5\frac{1}{2}$ inches; where broken, $5\frac{1}{4}$ inches. Condition dense, heavy, and highly embrowned—evidently a peat-bog specimen. State of preservation nevertheless very perfect, not encrusted, and the rugosities as clear as in a new specimen. The bez-tine has been apparently chopped with four blows, of superficial depth, then struck to detach it, causing an extensive fracture up the beam on the inner surface.

5.—Portion of shed right antler, with beam cut off $11\frac{1}{2}$ inches from burr. Circumference above burr, 8 inches; between bez and tres-tines, $6\frac{1}{2}$ inches. Much compressed, and singular as apparently having had a secondary brow-tine on its outer angle. Condition dense—evidently preserved by peat, and of considerable age, as the rugosities are filled up with lime. The beam appears to have been cut off at, and through, the tres-tine.* Three cuts appear to have detached this latter, and four cuts and a blow have separated the beam, the sawing having only penetrated the outer investment. An interesting slip of the tool below the tres (?), making a nick $\frac{1}{10}$th of an inch wide, shows that the instrument used was *thick* and probably of stone.† There is hardly any doubt that this was used as a weapon or tool, as there is a natural

* It is not certain whether this is the tres or not, as, in addition to a secondary brow-tine, there are two other knobs between them and the "tres," which may be other rudimentary tines.

† I made exactly the same width of nick in sawing a horn with a serrated Neolithic stone tool from the Danish kitchen-middens.

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grip for the hand below the tres (?) tine, and the fractured brow-tine appears to have been in exactly the right position for a weapon or tool, such as a poleaxe or pick, the beam becoming a natural lever of propulsion. In addition, it is extensively hacked on the burr, on its outside aspect, and also on the bulb of the burr itself. (See plate i., fig. 5.)

6.—Small portion of shed right antler. Beam fractured 11 inches from burr. Circumference above burr, $7\frac{3}{8}$ inches; between bez and tres, $5\frac{1}{4}$ inches. Two first tines newly fractured. Tres has been *chopped* with a rude instrument of no great size, a great number of cuts having been made around it, and forcibly detached by a blow. Thickly encrusted with calcareous matter. Somewhat heavy; condition intermediate. Has not apparently lain in peat, or bog.

7.—Crown, or upper portion of beam, of right antler, about 8 inches in length from above tres-tine, which latter is within $4\frac{1}{2}$ inches of bifurcation of fourth and fifth crown-tines. The fourth is broken off close to spring; the fifth is nearly perfect. Below the tres-tine the beam has been rudely cut from the outer side at five different places, and has then been detached by striking in the ordinary manner. Circumference below first furrow of bifurcation of crown, $8\frac{3}{4}$ inches; diameter 4 inches; shewing this specimen to be $\frac{1}{2}$ inch less in *circumference* than a Wapiti at the same point, but, owing to greater lateral compression, $\frac{1}{2}$ inch *wider* than the right antler, or equal to the much larger left antler, of the Wapiti. It is curious that all the *portions* of antlers recorded have been cut or broken under the crown, and no crowns have been found save this one and No. 11 (and No. 12?), both of which are severed at the same place. (See plate i., fig. 7.)

8.—Portion of shed right antler. Beam fractured 11 inches from burr, and all tines fractured, except brow, which has been partially detached by *four cuts* with a thin instrument, probably of metal, and then finally detached by a blow in the ordinary manner. Circumference above burr, $6\frac{1}{2}$ inches; midway between bez and tres, $5\frac{1}{4}$ inches; where fractured, $4\frac{1}{4}$ inches. Much compressed. Condition very dense, heavy, and of a stony nature. Encrusted with lime, and evidently of great antiquity.

9.—Small portion of shed left antler. Beam fractured 7 inches from burr. Circumference above burr, $6\frac{3}{4}$ inches; midway between bez and tres, $5\frac{3}{4}$ inches; where fractured, $5\frac{1}{2}$ inches. Condition dense, heavily encrusted, and infiltrated with lime. The bez-tine has been roughly *chopped* off with a rude instrument; the beam may have been also, but it is doubtful.

10.—Small portion of shed right antler, *cut* off at $7\frac{1}{2}$ inches from burr. Circumference above burr, $6\frac{5}{8}$ inches; where cut off (under tres) 5 inches. Condition intermediate; infiltrated with lime. The beam has been sawn off with five cuts, and probably detached by

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a blow. The tool having slipped just below shows it to have been a thin sawing implement. Both lower tines are fractured as if by use, and the reflection presents itself that it has been used as a small tool or weapon, the grip of the beam being exceedingly handy, and, if not used in its natural state, I could easily imagine that a celt may have been wedged and tied to the tines, thus forming a most efficient hatchet. (See plate i., fig. 10.)

11.—Portion of crown with 2 inches of beam, this latter having been sawn off at two or three attempts; formerly of three tines, two of which have been removed by rough cutting or chopping, thus forming a handle, broader at its base, for the third tine, which is 10 inches in length. From its shape and condition it gives one the impression that it might have been intended to be hafted and used as a pick. (See plate i., fig. 11.)

12.—Probably a crown tine. Somewhat twisted, sharply pointed, and flattened; 13½ inches in length, and 5½ inches in circumference at thickest end. This has been roughly severed by many chops, some parts of it flattened in the same manner, and gives the impression that it might have been intended for a dagger-like weapon, a purpose for which its shape and grip eminently fit it. (See plate i., fig. 12.)

13.—Portion of unshed left (?) antler, broken 13 inches from burr, extensively fractured and cut, therefore no measurements can be given. Probably bog specimen, and of some antiquity. Brow-tine split off and missing; beam cracked and with a wedge-shaped piece split out from bez to tres. The wedge-shaped piece, however, when re-fitted, proves the bez-tine to have been *sawn off*, at two or three cuts, with a thick, rude, instrument, probably of stone. The tres-tine has also been probably hacked or sawn off with an equally rude instrument.

14.—Fractured brow-tine, with part of burr attached, and beam split just above brow. Probably a shed antler. The convexity under the burr is worn flat and furrowed, rounded on the outer edge also, showing signs of extensive use, the furrowings being irregular, somewhat sharp, appearing as if it may have been used as a small mallet with which to strike a "fabricator" when chipping flint implements. The split midway through the crown of the burr seems to favour the theory that this has been used as a mallet. (See plate i., fig. 14.)

15.—Portion of tine, 9-10 inches long. Condition dense and encrusted with lime. Has been *hacked* off from its base with a great many cuts of a rude instrument. Midway is a notch apparently made by a blunt instrument, probably of stone. The point has been flattened and trimmed, for some little distance on its inferior aspect, by chopping or hacking. The extreme point is, however, broken off, apparently by use. (See plate i., fig. 15.)

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16.—Portion of tine, 7-8 inches long. Condition dense and encrusted with lime. Smoothly severed from base by apparently one cut of a sharp instrument passing completely through the cancellated structure of the horn, being, in this instance, entirely different from any previous specimen, all of which have, without exception, been severed by repeated cuts or hacks. Extreme point broken off. (See plate i., fig. 16.)

17.—Small portion of antler about 7 inches long, irregularly chopped off at junction of burr and brow-point (?). This, which is dense and highly embrowned, having evidently lain a long time in a peaty deposit, is the tool or weapon I saw taken out at a depth of 11 to 12 feet, from under the skull, No. 1. The figure (No. 17, plate i.) will give a better description of it than words. It will be seen by this that the tine has been roughly chopped to an acute point by many blows of a small instrument, whose width was apparently not more than $\frac{3}{4}$-inch, with a curved edge of some thickness. The beam portion has been roughly chopped into shape, and, at the summit, into two cross channels, which have left four points nearly $\frac{3}{4}$-inch long. The cross channel would, no doubt, be made for attaching it to a handle, or for bending a withe over and tying in underneath. The longitudinal channel, however, is not so easily explained, unless it was intended to attach it by cross lacings of sinews or what not. It may be that a stone or piece of metal was inserted longitudinally —and this supposition seems to be warranted by the difference of level in the longitudinal channel, the higher level acting as a stop —the whole making a chopper or hatchet at one end, and a pick at the other. The manner in which a stone hatchet is bound into a wooden handle, as exhibited in a tomahawk from New Zealand in the Leicester Museum, is somewhat similiar, and Evans (pp. 143-145) mentions Stag's horn sockets for stone tools, which seem, however, to be of rare occurrence. On the other hand, it may have been intended to be used merely as a pick, chisel, or weapon, by binding it on to a shaft as I first suggested; but I still incline to the belief that a subsidary implement has been inserted in the channel. I cannot, however, satisfy myself whether the point has been actually used or not, although there is a slight appearance of what may be the burr of concussion. The four points of the channelled part are more or less fractured, and, if not by use, it may probably have been spoilt in the making and thrown away. It may be urged against the high antiquity of this, that, in the shaping, a tool, presumably of metal, was used. Admitting this to be the fact (although the same appearances could be presented by chopping with a sharp implement of flint or compact stone), it is well known that the stone age overlaps the metal in the history of all nations; one instance only need be given: Catlin ('Last Rambles,' p. 101) found an Indian tribe of Nootka Sound, "who,

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without the aid of fire, cut down the large cedars for their 'dug-out' canoes with chisels formed from the horn of the Wapiti, struck by mallets of stone hafted in withes, and somewhat like dumb-bells in shape."* This, be it remembered, amongst tribes who presumably used weapons and tools of steel, and who certainly had access to traders bringing the tools of civilization; the reasoning will hold good therefore, in both cases, that, although both may have been in possession of metal (cutting) implements, yet that they would reserve these precious implements for fashioning tools of other materials, to take the place of a metal too precious to be risked in every-day avocations, or in other than warfare.

18.—Part of a tine 4 inches in length, point broken off, and thick end rudely cut and flattened at the sides and drilled with a hole varying from $\frac{1}{3}$ to $\frac{3}{10}$ of an inch (see plate i., fig. 18). This was submitted to Mr. Franks, who says, "I can say nothing as to this. It does not look like a barrow specimen, (?) same age as last." (*i.e.*, the previously described and figured bone articles, *a* to *f*, plate i.) Looking at this, I feel tempted to again hazard the conjecture that, like fig. 1, plate ii., it may be part of a horse's bit.

Summing up the evidence, it may be at once stated that it cannot be proved that these antlers were cut with stone implements, although my experiments in that direction have resulted in similar appearances. No flint knives or other cutting stone implements were found at the time, and probably in this I am wholly to blame, not at that time recognising the importance of searching for such things, and since then the ground has been entirely disturbed and made up. Nor, indeed, can I prove that these may not have been Roman *débris*, for the Keltic Long-faced Ox, *Bos longifrons*, which dates from the earliest Neolithic times, is often found associated with admittedly Roman rejectamenta (see, amongst other authors, Wright's 'The Celt, the Roman, and the Saxon,' pp. 344-5), added to which, it is well known that the Romans used Deer horn for a variety of purposes, and that rubbish-heaps and pits are found in the vicinity of Roman villas, containing remains of all the mammals which I found at Barrow, viz., Long-faced Ox, Hog, Goat, and Red Deer. The site was also within a field or so of where the interesting glass cinerary urns, and other Roman sepulchral remains were found, which are now in the Museum.

The only evidences of a higher antiquity than the Roman occupation are (1) the very rough manner in which most, if not all, of the antlers have been cut, which argues but little for the trained skill of such operators as the Romans, (2) the evident purpose for which many of them have been intended, or have been applied, which would hardly seem to warrant a supposition that they could have been made or used by Romans,

* See also Evans' "Ancient Stone Implements, Weapons, and Ornaments, of Great Britain," pp. 380-389.

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who were presumably in possession of much more efficient tools and weapons, and (3) the well-known fact that the association of the late Keltic peoples and the early Roman invaders was of so mixed, and yet of so fluctuating a character, that we may clear the ground as to the apparent association of Roman with Pre-historic remains, by assuming that Barrow itself, to say nothing of the origin of its name, was, from its proximity to a river and the ancient fastnesses of Charnwood, the very spot likely to be selected by successive encampments of a nomadic race of hunters, or by the "peat-bed and alluvial Neolithic farmers," prior (and subsequent) to the encampments of Romans. Men of all periods would choose such a spot, and that admittedly Roman *débris* is found overlying the tools, weapons, and rejectamenta of "Pre-historic" Man argues nothing, save that a refuse pit, or what not, of one race would probably be used by another set of men, coming after, for the same purposes.

The Barrow find caused me to look over the skulls and antlers of the "peat-bog, Pre-historic" type possessed by the Museum, some of very large size,* with the result that I find several interesting examples, viz.—

Portion of shed left antler, with large burr (cut?), dug out of a gravel pit at Twyford. Presented by Mr. H. Bickley, 13th July, 1854. Large, but broken below tres-tine. Length 12½ inches. Circumference above burr, 8½ inches, and between bez and tres-tines, 6½ inches. Condition friable.

Portion of left antler, broken from skull and *cut* above bez-tine, found at Soar Lane Mill, at a depth of 14 feet, 11th January, 1879. Presented by Mr. G. H. Nevinson. Circumference above burr, 8¾ inches; around brow-tine, 4¾ inches. Condition exceedingly dense and stony. Three distinct cuts have been made to separate the beam above the bez-tine, apparently with some thin, saw-like instrument, except for the fact that just below, and in other parts of the antler, are notches, $\frac{1}{10}$-inch wide, as though the instrument had missed. The striations on the cut, although very plain, are not recent, as they have taken the colour of the ferruginous gravel in which the specimen was found embedded. (See plate i., fig. F.)

Portion of skull (frontlet), with antlers *cut* off above brow-tines, found at the Flood Works, Braunstone Gate, at a depth of 12 feet, on the gravel, 1885. Presented by Mr. John D. Harris, 23rd May, 1887. Circumference of each beam above burr, 8¼ inches. Condition exceedingly dense, heavy, and stony. Both brow-tines and beams above have been cut off with some rude instrument. Two cuts have disengaged the right beam, and one or two cuts and a blow have taken off the right brow-tine. Three cuts, partially through, and a blow fracturing the horn on its inner face,

* For measurements and history see "The Vertebrate Animals of Leicestershire and Rutland" (now in the Press), by Montagu Browne, F.Z.S.

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have removed the left beam. The left brow-tine has been cut twice, and then struck to detach it; and, curiously, this appears to have been cut with a thinner, more saw-like instrument than any of the others, and looks fresher. This skull is almost similar to the Barrow specimen, No. 1.

19.—Shed right brow-tine, cut from the beam at its junction with the burr. Found at the Flood Works, "Twelve Bridges," at a depth of 12 feet, in blue clay, 5th of May, 1887. Condition dense, encrusted with calcareous matter, and evidently of considerable antiquity. From the rounding of the edges of the cut portion, there is little doubt that this was severed by successive cuts with a stone implement. Though admirably adapted, by the natural grip afforded, for a hammering instrument, it has evidently not been used for that purpose, as the burr shows no signs of concussion. From the condition of the point, however, and other appearances, there is hardly any doubt that this has been bound on to a shaft and used as a pick. Two holes in the cancellated structure appear as if they may have helped to retain the points of a split haft, and just under the burr itself are evident marks of the abrasion caused by the binding thongs. (See plate i., fig. 19.)

Anxious to discover if antlers could be cut with the celts and bronze daggers with which these people may have been acquainted, and also with the stone tools which we know they used, I made a series of experiments upon a fresh antler of *C. elaphus*.

I tried first upon the bez-tine, which was cut around with a small flint implement from Yorkshire, and detached by striking it sharply with another piece of Deer's horn. The cut, save for a slight rounding, is as sharp and clear as if done with a knife, but this not having gone deep enough, the blow caused a fracture on the inner side of the tine, similar to that on the antler No. 4, shewing that, in that case also, the blow was struck before the horn had been sufficiently cut around to ensure its breaking off evenly.

(2) The tres-tine was next cut with the same flint implement, but the cutting, in this case, was made to go through the outer investment, the tine being then detached by a blow with a piece of stone. The faces of the cut portions shew the many small cuts which were made around the tine, as in antlers Nos. 3, 5, 6, etc., but there is little or no rounding of the edges to lead to the supposition that the incisions had been effected by means of so *thick* an implement, and, no doubt, with greater experience and a more efficient flint tool, a tine could be severed as cleanly as if cut with a metal instrument.

(3) Using the same flint implement with a sawing motion, I was enabled to pare down one of the crown-tines, shewing how horn might be shaped in the manner of Nos. 17 and 18.

(4) Discarding the stone, I next tried what could be done with a metal implement. Selecting the bronze dagger (plate ii., fig. 5) found beneath the

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River Wreake, I worked with this upon the beam just above the burr, and, having made a series of cuts around—which this implement, in spite of its age and broken condition, effected very well,—finally detached it by holding an antler in each hand and striking it just below the cut on the summit of a block of stone. The appearance presented is that shewn in several of the Barrow specimens, viz.: a number of small cuts, easily traced by the directions of the striations, have penetrated the outer investment on every side, leaving sharp edges and an even surface after the core had been broken through.

(5) Wishing to imitate the chopping appearance shewn on many of the specimens, I selected a bronze celt, into which I inserted an ash handle, bent by boiling and kept in position by wedges of wood at the top, and by being tied over, and from the loop in the celt, with string, to the middle of the handle, in the manner in which we suppose the celts to have been used. The first hacks made with this, to me, novel tool—on the upper face of brow-tine—were somewhat rough and uneven, but by dint of practice I was able to cut out the sides of the beam and bez in such a manner that, although effected by means of a great many little chops, the cut surfaces presented the appearance of having received but one blow each with a sharp axe of the present day; and so expert did I become, that I was enabled to chop a wedge-shaped ridge in the inner angle of the bez and beam, cutting the bez at the same time longitudinally, to shew that paring and shaping could be effected with this instrument.

(6) The next essay was with another bronze celt, similar to the last, into which I inserted a rough piece of wood, using it in the manner of a chisel by striking it with a mallet, and by this means I cut a portion out of one side of the tres-tine, cut a groove around it about an inch below the point, and a longitudinal piece away, in such a manner as to prove that, not only could tools and weapons be shaped from Stags' antlers with these implements, but that they could also be carved and ornamented. The nick or groove made by this is extraordinarily narrow, and would lead anyone to suppose that it had been made with a totally different instrument. This induced me to make another experiment, when, by using the same celt in the same manner, I detached the tip from one of the crown-tines, which a few blows sufficed to do, making a less rude appearance than that presented by No. 15, though of the same character. On the same tine, just below, I was enabled, with the same tool, to make a lengthy cross channel, showing how easily No. 17 could have been channelled out and hewn into shape by any of the methods I have described.

That antlers were cut and formed in like manner by people to whom bronze was a luxury, or who were unacquainted with the use of that metal, is abundantly proved, and, with reference to the Leicestershire specimens, the coincidence is singular that Sir C. Bunbury, in describing a lake dwelling at Wretham, near Thetford, in vol. xii. of the 'Geological Journal,' says:—"Numerous horns of Red Deer have been found in the peaty mud (as I was informed) at five or six feet below the surface,

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seldom deeper; many attached to the skull, others separate, and with the appearance of having been shed naturally. What is most remarkable, several of those which were found with the skulls attached had been *sawn off* just above the brow antlers,—not broken, but cut clean off and smoothly, evidently by human agency." See also Skertchley ('Geology of the Fenland,' p. 248), who further remarks:—"The Neolithic flint pits at Grime's Graves, near Brandon, were worked with Deer antlers the brow-tine being used as a pick." Greenwell and Rolleston, in their "British Barrows," mention at p. 37, and figure at p. 43, a hammer and a pick both made from Red Deer antlers, and further, at pp. 217, 231, and 432, describe the same and other antlers found in various barrows, including those of Grime's Graves mentioned above, which bore evident traces of having been used either as instruments or weapons. (See also Evans' "Ancient Stone Implements," pp. 30-31). Mr. Evans (see p. 386, "Ancient Stone Implements") found, in 1851, in a disturbed barrow at Sutton Cheney, Leicestershire, a bone pin, perforated at one end. Mr. Worthington G. Smith, F.L.S., in the "Essex Naturalist," 1887, p. 129, appears to have found a fragment of a fossil antler of Red Deer, on the "Palæolithic Floor" at Little Thurrock, which he thinks distinctly shews a fracture produced by the straight edge of a *Palæolithic* implement. (The italics are mine.)

Probably many of the ruder bone implements exhibited in the Leicester Museum, and referred by previous Curators to the Roman Period, are the work of Pre-historic Man, although there is no doubt that the Romans may have used or even made such as these for the same purposes as their Pre-historic forerunners,—Man, in his early development, being an adaptive rather than an inventive animal.

I think there is no doubt that *Cervus elaphus*, which is really a survival from the earliest part of the Pleistocene division of the Tertiary Period, was formerly of extreme size; and I am disposed, taking age into consideration, to assign to those antlers having the greatest circumference above the burr the highest antiquity, and would think that probably antlers of the character of Owen's *Strongylocerus spelæus* (see "British Fossil Mammals and Birds," pp. 469-470), which—though 15 inches in circumference, rivalling the antlers of the extinct Irish Elk—was undoubtedly that of *Cervus elaphus*, should be referrible to early Pleistocene times, and are probably Pre-glacial, and that antlers of less circumference down to 10 inches would include Mid-Pleistocene times, and from that to 8 inches late Pleistocene and Pre-historic periods. Of course, these calculations are rough, and are by no means constant. The age of the specimen when living must be considered, as also the position and surroundings when found, but antlers of 8 inches and over always seem to me to be of greater antiquity than those of lesser circumference. I leave out of all calculation the antlers of existing Scotch stags and those of German Forests. I am merely generalizing upon those in a fossil or semi-fossil state found in the caves, alluvia, and peat-bogs of England.

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My theory would seem to be somewhat borne out by the opinion of Professor Boyd Dawkins, to whom I submitted the whole of the Barrow and other deer antlers enumerated, and who, after kindly examining them, replied:—"The large antlers are nearly all of the large, peat-bog, Pre-historic type." It is with some show of reason, therefore, that we may refer some of the *cut* antlers in the Museum to the "Pre-historic" Period, defined by him (see "Quarterly Journal of the Geological Society," pp. 400-402) as that preceding the "Historic" Period, but to what division of that period the remains are referrible is uncertain.* There are, however, evidences that they are of considerable antiquity. In front of this we must assume that the cuts were made at a time coeval with the Deer which furnished the horn, although in one or two doubtful cases I am willing to admit that the antlers may have been recovered from boggy places—vide their condition—and subsequently cut. The most convincing proofs, to my mind, of their high antiquity, and of their proper reference to the Pre-historic Period, are, 1—that the people who sawed or cut the antlers were possessed of but rude and imperfect tools with which to perform this operation, and 2—that nine-tenths of the antlers thus operated on were *shed* antlers, which fact militates also against the operators being possessed of weapons capable of overcoming such strong, fleet, creatures as this race of Deer must have been.† Lastly, I would direct special attention to the fact that *all* the *cut* antlers as yet discovered and described are those of the indigenous Red Deer, *Cervus elaphus*, L., and that none were associated with remains of the Fallow Deer, *Dama vulgaris*, Gray, which there is every reason to believe was introduced by the Romans.

DIVISION II.—POTTERY.

I place first on the list, as doubtfully either Roman or late Keltic, the red pan of earthenware (marked D, on plate ii.) found at Barrow-on-Soar, on 15th July, 1886, and about which Mr. A. W. Franks, M.A., F.R.S.—who has kindly examined for me this and other objects which I have lately submitted to him—remarks:—"This looks very queer. If certainly found on the spot, not older than Roman." It is very new looking, semi-glazed a light red, the fractured part, however, shewing whitish-yellow like Salopian ware, and, although of irregular shape, has been apparently rudely turned. It is $7\frac{1}{8}$ inches in longest diameter, $6\frac{1}{2}$ in shortest, and is $2\frac{1}{4}$ inches in height.

* Instead of the terms Neolithic=Pre-historic=Keltic, with the subdivision of the latter synonym into "late" and "early," I would propose that Pre-historic stand for the whole period, with the subdivision Neolithic for "early" and Keltic for "late."

† When writing this, I had not seen the following paragraph in Greenwell and Rolleston's "British Barrows" (p. 110):—"The antlers found in the barrows (and the same was the case at Grime's Graves) are almost always shed ones, it being very rare to find one which has been taken from a slain animal. The abundance of the antlers shows how plentiful the beast was, the rarity of any but shed horns appears to indicate how seldom it was captured. The evidence of the Swiss Lake Dwellings points in the same direction."

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The next is described in the Donation Book as a "British or Celtic Urn, containing fragments of bones, and coins of Hadrian, Julia, &c.,* discovered on the summit of Mountsorrel Hill, April, 1859. Through John Martin, Esq., per Lord Lanesborough." This is preserved in the Leicester Town Museum. Mr. Franks queries if it is not a British "incense cup." It is of red earth, ornamented with the usual herring-bone pattern, and is $2\frac{3}{4}$ inches in height, $4\frac{1}{2}$ inches outside diameter, but, owing to a broad rim, is but $3\frac{1}{4}$ inches internal diameter. (See plate ii., fig. A.)

The third example is a large cinerary urn,† of the usual type, containing charred bones. It is 13 inches in height, $9\frac{1}{2}$ inches outside diameter, and $8\frac{1}{2}$ inches inside the rim. It was found in the Tumulus called "Round Hill," Syston, many years ago, passed into the possession of the late Colonel Joseph Knight, and was presented by Captain (now Major) Gregory Knight, on 8th December, 1880. (See plate ii., fig. B.)

The fourth, and last, urn we possess is also cinerary. It is, however, much smaller than the last, its height being only $5\frac{3}{4}$ inches, and its internal diameter about $4\frac{1}{4}$ inches, but this is difficult to determine, as its back portion is broken out. It is of ochreous clay, reddish in parts, the fractured portion shewing the blackness of burnt clay. It was purchased for the Museum on 22nd September, 1887, from the late Mr. J. E. Weatherhead's collection, and was labelled:—"Saxon Urn, discovered at Aylestone Park, near Leicester, 4 feet deep. November 8, 1875." It is so obviously British, that it hardly needed referring to Mr. Franks, who kindly confirmed my opinion. (See plate ii., fig. C.)

I find in the "Transactions of the Leicestershire Architectural and Archæological Society," vol. ii., p. 275, that, at a meeting held on 30th November, 1863, the Rev. J. H. Hill exhibited "drawings of two pieces of pottery, found some time ago at Nosely, and now in the possession of Sir A. G. Hazlerigg, Bart. Judging from the ornamentation of the pottery, as shewn in the drawings, it would belong to the Early British Period, being chiefly composed of zigzags and parallel lines."

Mr. W. J. Harrison, F.G.S., the late Curator, in his interesting and valuable "Geology of Leicestershire and Rutland" (p. 50), writes:—"A curious ring dug up in alluvial soil, at Barrow-on-Soar, by the late Mr. Hollings, is 4 inches in diameter, with a central hole of $1\frac{5}{8}$ inches. It is blackened on one side as if by fire, and appears to be made of baked clay." This, which I have submitted to Mr. Franks, is described by him as "Baked clay. Not unfrequent. Age and use unknown." (See plate ii., fig. *a*.)

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* This was probably an error, for, in a letter dated November 11th, 1859, received by the late Mr. Weatherhead, the then Curator, Mr. C. Roach Smith, F.S.A., writes:—"I infer you do not think the Roman coins were at all connected with the deposit of the urn. Probably the locality had been resorted to through successive Generals, or even ages, for burial." If, however, the coins *were* actually deposited within the urn, is it not possible that this latter was originally wrested from the Coritani, or some other subjugated Keltic tribe, and passed into the possession of the Romans, who buried the treasure, or that the late Keltic people associated with the Romans may have buried the coins in one of their own urns?

† Precisely similar to that figured at p. 151, "British Barrows," Greenwell and Rolleston.

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Another ring of baked clay was found during excavations for the Poor Law Offices, Pocklington's Walk, in 1882-3, at some considerable depth from the surface, and was presented to the Museum by the Guardians on 11th August, 1883. It is rather more oval, and much redder than the preceding, and is $3\frac{3}{4}$ inches by $3\frac{1}{2}$ inches in diameter, with an aperture $1\frac{1}{2}$ inches by 1 inch. Now marked *b*, in the Museum collection.

DIVISION III.—BRONZE.

HORSE-TRAPPINGS, ETC.

The first specimen (plate ii., fig. 1), marked as "Roman (deleted) Sword-hilt. Found at Great Easton, Leicestershire. Presented by A. Bell, Esq." (N.D.), is $3\frac{7}{8}$ inches in length, $\frac{5}{8}$-inch across in centre, and about $\frac{4}{10}$-inch at the small end, and appears to have been rudely scratched or engraved thus :—

Of this, Mr. Franks writes :—"Late Celtic, but not a sword handle; possibly part of a bit. All bronze. A number of these in Brit. Mus., from Polden Hill, Somersetshire, found with horse-trappings."

The next is shewn on plate ii., fig. 2, and is described on the tablet as "Discovered at High Cross (the Ancient Venonnes)," but is without a date, nor can I discover when it was presented to the Museum. It is formed of two discs of bronze connected by a hollow, necked, spindle, narrowing in the centre to $\frac{3}{8}$-inch. The bottom disc of metal, $3\frac{1}{2}$ inches in diameter, is a fixture with the spindle; the top, however, which is shewn as the outward aspect in the figure, and is $3\frac{1}{4}$ inches in diameter, revolves upon the spindle, by the hammered flange of the latter coming through the orifice of the disc. Some considerable skill has been expended upon the workmanship, and the ornamentation by turned ridges is shewn in the figure. Mr. Franks describes this curious article as "Late Celtic, *i.e.*, early Iron Age. Similar in British Museum. Sometimes closed at one end, sometimes not. Possibly ornament of chariot wheel, but?"

Nichols, in his "History of Leicestershire," vol. iii., part 2, at page 1127, gives a plate of eleven bronze implements, which are described as having been found "on 23rd December, 1801, by Matthew Grocock and James Allam, of Husbands Bosworth, about 6 feet below the surface, in a piece of land belonging to Francis Fortescue Turvile, Esq., called Gravel-pit Close." One of these bronzes figured gives the impression that it may have been intended for part of a chariot-wheel also, but it is so imperfectly drawn that it is very difficult to determine. The present Sir Francis Turville, to whom I have written, replies that they are not

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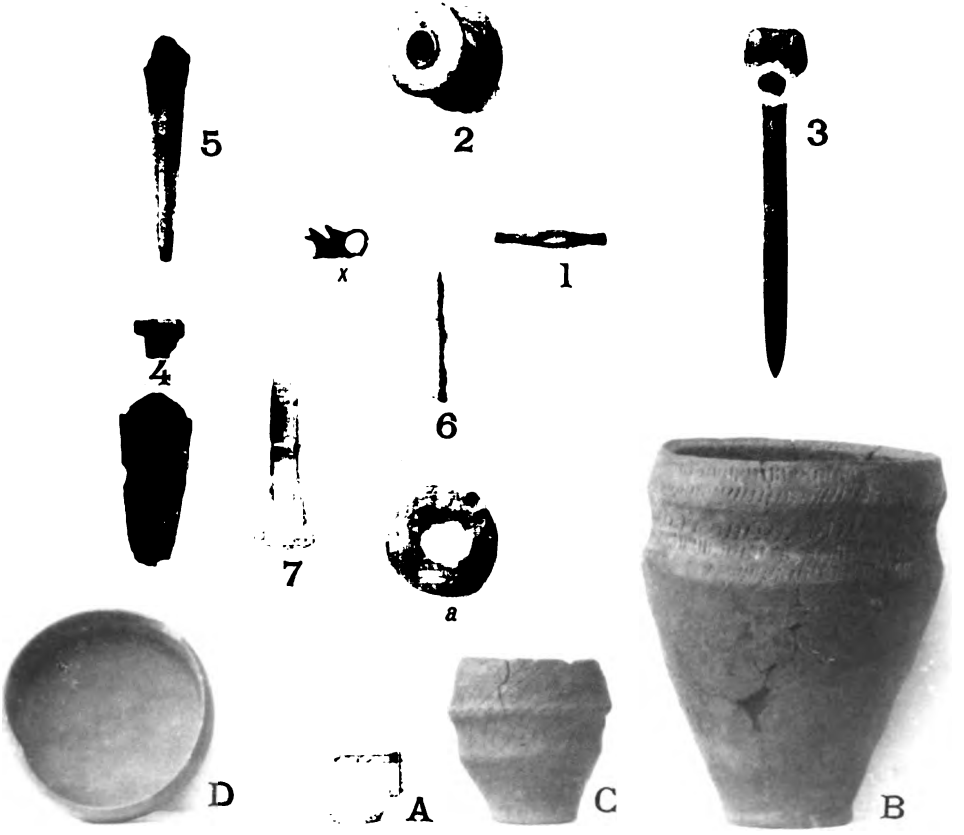

DIVISION II.—POTTERY. AND DIVISION III.—BRONZE. PLATE II.

J. Fleming & Co., Collo-Type, Leicester.

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in his possession, but that he is under the impression they are in the British Museum.

In the "Transactions of the Leicestershire Architectural and Archæological Society," vol. v., p. 41, it is recorded that, at a meeting held 25th September, 1876, Mr. G. H. Nevinson exhibited a bronze article from excavations in Bath Lane, 5 feet from the surface. "It was part of a horse's bit of the late Celtic period, and similar in form to a perfect specimen found near Hull, and now preserved in the British Museum." Mr. Nevinson has kindly entrusted this to me for description. It is of a nice, dark-green colour, and well-preserved, and I should imagine it to be part of a snaffle-bit, made in one piece. Originally, no doubt, $2\frac{3}{4}$ inches, it is now, by the breaking away of part of one of the two end rings, $2\frac{1}{2}$ inches in length, by $1\frac{1}{10}$ inches across the remaining ring. The central space is necked, and is filled by three conical points arranged triangularly, each rather more than $1\frac{1}{4}$ inches in height. (Shewn on plate ii., fig. *x*.)

PERSONAL ORNAMENTS.

The late Mr. Perry-Herrick exhibited, at a meeting of the Leicestershire Architectural and Archæological Society, on 26th April, 1858 (see vol. i., p. 168, of the Society's "Transactions," where it is figured), a Bronze Armlet, unornamented, found about fifty yards from the Spear-heads and Celts (hereafter described), and outside the encampment on Beacon Hill, Charnwood Forest.

This, with the remainder of the find hereafter named, is described by Mr. Harrison (p. 51), who says:—"A valuable find of bronze objects was made at Beacon Hill. These are described in the 'Gentleman's Magazine' for 1858, and are now in the possession of Mrs. Perry-Herrick, of Beaumanor."

DAGGERS.

The first of these (plate ii., fig. 3) is described on the label as "Blade of Ancient British Dagger found in excavating for the Flood Sewer in the Abbey Meadow, at a depth of 12 feet. Literary and Philosophical Society," and the Donation Book gives the date, "Nov. 15, 1853." It is $5\frac{3}{4}$ ounces in weight, $12\frac{1}{4}$ inches in length, $\frac{7}{8}$-inch in width at centre, $2\frac{1}{4}$ inches across at set-off of blade under the two large rivets, which remain intact, the handle having perished. In very good preservation. Mr. Franks remarks of this:—"Very good dagger, like Thames specimens. Rivets unusually large." Described also by Mr. Harrison (p. 51).

The discovery of the second appears to have made the most impression upon those desirous of finding Man's antique weapons in juxtaposition with his bones, and is to be found recorded in the "MS. Donation Book," Leicester Town Museum, under date 22nd October, 1874, as follows:—"Fragments of skulls of roebuck and ox found in blue clay in bed of River Wreake. Fragment of human skull and

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copper spear-head found lying on gravel under blue clay in same place. The above were brought to light in widening the Railway bridge across the Wreake (at Syston) for the Midland Company, June, 1873. Presented by J. A. McDonald, Esq., Engineer to the Midland Railway Co." The piece of skull itself, however, bears the following inscription, presumably written by that gentleman himself:—"Found at River Wreak, Syston, near Leicester, 19 feet below surface of ground and 11 feet below bottom of River, in gravel, lying on red marl under 17 or 18 feet of bluish mud, and about the same level as bronze spear-head.—1873, June.—J. Allen McDonald."

Whoever originally named the specimens appears to have fallen into two errors; the first being that the so-called "copper spear-head" proves to be part of a bronze dagger, and the second, that the part of the skull of the "roebuck" is part of that of a goat or sheep,—so Prof. W. Boyd Dawkins kindly informed me, when I, being in doubt, submitted the so-called roebuck to him.

From the inscription on the skull—which, with those of the goat and ox, and the spear-head or dagger, is fortunately preserved—I have prepared a plan (A) by which it will be seen that, although the human remains rested in or *on* the gravel, 19 feet below the surface, yet that the bronze dagger found with them would not apparently favour the theory of any high antiquity for these remains; nor, indeed, does the fact of the skulls of the goat, or sheep, and ox lying *above* the human skull—a point rather dwelt on at the time—prove the high antiquity of any, if the dagger was actually associated with the piece of human skull, for, although the other mammalian remains—frontlets of goat, or sheep, and long-faced ox (*Bos longifrons*)—might with propriety be referred to the *earliest* Pre-historic = Neolithic Period, yet the later bronze weapon sufficiently disposes of that theory, unless, indeed, the human skull and dagger, being heavier, sunk deeper in the morass than the other fragments.

Be this as it may, the fragment of human skull—6½ inches in length, portion of left frontal (shewing part of supra-orbital ridge) and parietal with suture of junction with squamosal—is of very low type, and, *without* the association of the dagger, might be of the highest antiquity.

Figure 5, on plate ii., represents this latter, of yellowish bronze, as usual without a handle, and otherwise imperfect. It is 8 inches in length, and about 1⅞ inches in breadth at top, if perfect, tapering to ⅜-inch where broken. Iron rust is distributed over the surface, more thickly where the handle should have been, but from what cause it is now impossible to say. Mr. Franks says of this:—"Usual Bronze Age. Would have been a nice specimen if better preserved."

An interesting, broad, leaf-shaped, knife-dagger, extensively corroded, was discovered with the remains of a human skeleton, on 23rd April, 1868, about 2 feet deep, resting on the gravel, in Sydney Street, about 7 feet from the edge of the foot road leading to Belgrave. Presented by George Harrison, Esq. It is 6¼ inches in length (originally, probably, a

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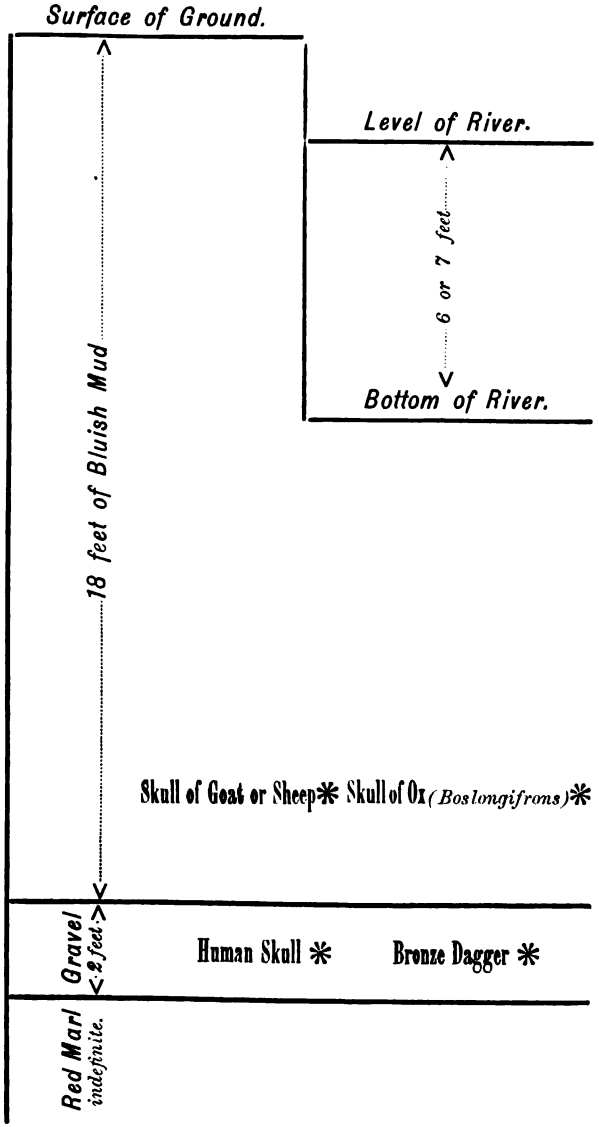
(A)

Section at Railway Bridge over the River Wreake at Syston.



Scale: ½ inch to the foot.

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little longer), and 2½ inches across at shoulder. Nine rivets, symmetrically arranged, secured it, originally, to a bone handle, of which the upper part —of a long oval form, 1¾ inches in length, and stained bright green from the bronze—still remains. Under this is an inch or so of the broad flat tang, carrying eight rivets arranged in three lines. (See plate ii., fig. 4, blade with portion of handle above it.) As might be imagined from its antiquity, this dagger is in a very bad state of preservation.* The singular interest attaching to these implements is, that they appear never to have been used for any purpose but for burial with the dead. Mr. Franks says of this:—"Good Sepulchral specimen. Early Bronze Age." Mr. W. J. Harrison mentions this at p. 51, "Geology of Leicestershire and Rutland," and there says:—"resting on a human skull."

SPEAR-HEADS.

The late Mr. Perry-Herrick exhibited, as before described, on 26th April, 1858, two spear-heads found in cutting a drive through the encampment on Beacon Hill, Charnwood Forest. They were nearly alike, and of the shape which has been called "myrtle-leaf," with round sockets (without rings) for the reception of the wooden shafts, the sockets, in both cases, going some way into the blade of the head. One specimen measured 7½ inches in length; the other, the tip of which had been broken off, 6½ inches.

Figure 6, on plate ii., shews a small Spear-head, about which Mr. Franks writes:—"Nice specimen if better preserved. English type." It was found at Bardon, and presented by Mr. J. B. Ellis on 12th August, 1884. It is 4¾ inches in length, ½-inch internal diameter of socket, and has small bar loops on each side, rather more than ½-inch from base.

CELTS.

Nichols ("History of Leicestershire," vol. iii., p. 1127) figures, as before stated, a number of celts. Two are of the ordinary shape, without side-rings, but socketed, and with unornamented bases; they vary in size. Three, with side-rings, are of the usual shape, of which two are slightly ornamented towards the base. Another is half-moon shaped, with socket and ring. Three others are of a gouge-shaped pattern—one specimen broad, and two narrow,—and the remaining two are plain and spear-shaped.

Potter, at p. 42, "History and Antiquities of Charnwood Forest," figures a celt—presumably of bronze—5¼ inches in length and 1½ inches broad, found at Benscliffe in 1818, which appears to have had a ring on one side. His own opinion of it was that it was placed in a cleft stick, and used by the *Druids* for cutting mistletoe! (Poor Druids! Our forefathers, when in doubt, attributed anything and everything mysterious to these *Dryads*. The older Greeks had the same happy knack of shifting responsibility from the actual to the mythic.)

* At p. 77 of Wright's "The Celt, the Roman, and the Saxon," a figure is given which would almost exactly represent this specimen, if restored.

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The late Mr. Perry-Herrick exhibited, as before described, on 26th April, 1858, two celts found in cutting a drive through the encampment on Beacon Hill, Charnwood Forest. One, 4½ inches in length, was of the ordinary shape, with a side-ring through which to pass a thong for binding it firmly to the handle; the other, 3½ inches in length, was of an unusual description, being gouge-shaped, with a socket for receiving a handle. Mr. Harrison remarks, at p. 51:—"Many other bronze celts, spearheads, etc., appear to have been found in the County, but, having remained in private hands, they have become lost or dispersed."

Several bronze celts are in the Museum, but with no history attached, save two which are not local.

I have, however, been fortunate enough to secure the first local bronze celt ever possessed by the Museum, through the kindness of Mr. Thomas B. Beeson, of Atkin Street, Leicester, who presented it on 1st August, 1888. It was found at Bardon Hill about 1875, by a labourer named John Toone, whilst ditching, and is plain and of the ordinary type. It is ¾lb. in weight, 6½ inches in length, and 2¼ inches wide at the cutting end. Mr. Beeson describes it, when it first came into his possession, as being covered thickly with dark-green patina, but this he has, unfortunately, chipped off, being curious as to the metal of which it was composed. It is now, therefore, only a light green. It has, unluckily, been broken, probably by the pick of the discoverer, at 1¼ inches from the small end. (See plate ii., fig. 7.)

DIVISION IV.—STONE.

HAMMER-STONES, OR PESTLES, AND QUERNS.

The Donation Book records the presentation, by the Misses Roby, on 18th March, 1861, of a stone pestle or muller, which was found with a large flint ball at Cliff Hill,—apparently in 1858. It is of limestone, in length 12 inches, by 2½ diameter at the largest or convex end, tapering to about 2 inches at the smallest end, where it is roughly fractured, as if by use. It is mentioned at p. 228, "Ancient Stone Implements" (Evans) a figure of one precisely similar being given on the same page, and also by Mr. Harrison, at p. 50 "Geology of Leicestershire and Rutland," who adds:—"The mortars with which these pestles were used have been frequently mistaken for *fonts*." This, though mis-labelled, has been recently referred to its proper position in the Museum by means of the above measurements, as also the "saddle quern" of syenite mentioned on the same page, which was secured for the Museum by Jno. Biggs, about 1872, from amongst boulders brought to the Museum from the site of the Cattle Market, Aylestone Road. This last is, I think, probably Neolithic; the pestle, however, appears of later date. (See plate iii., fig. 4.)

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Another pestle or hammer-stone, much smaller, 5¼ inches in length, by 1 inch in diameter, but of less diameter in the middle, as if by use, was presented to the Museum, some years ago, by Mr. Joseph Goddard, as part of the collection of local and other antiquities formed by his father, the late Mr. Henry Goddard, previously referred to on p. 9. Mr. Goddard tells me he is quite sure it is local, and it is therefore figured on plate iii., fig. 6.

Mr. William Hicklin, of Noble Street, Leicester, kindly lent me a curious and interesting object to describe and figure, which, if not a whetstone or hammer-stone, may have been used as a stone bat or club. It is intermediate in form, between figs. 178 and 179, p. 230, "Ancient Stone Implements" (Evans), and is a foot in length, 2¾ inches in diameter, quadrangular in shape, with two faces, each 1¾ inches, and the other two each 1½ inches in width. It is of Charnwood slate and fractured on both surfaces at each end, and was found in the bed of the Soar, near the Abbey Meadow, in 1881. (See left-hand bottom figure *c* on plate iii.)

AXE-HAMMERS.

Mr. Harrison describes, at p. 50, "Geology of Leicestershire and Rutland," the two following :—

A very fine perforated axe-hammer "made of a compact greenstone was dug up in the Leicester Cemetery in 1858. Its length is 7 inches, and breadth 3½ inches. It is flat at one end and pointed at the other." This was presented to the Leicester Museum by Mr. Thomas Forster. (See plate iii., fig. 1.)

A perforated axe-hammer "of similar form, but rather larger, was found at Barrow-on-Soar in 1870. It occurred in the same field as the Roman remains found in 1867, and, like them, was generously presented to the Leicester Museum by Messrs. John Ellis and Sons. It is formed out of one of the blue-hearted nodules of either the Marlstone Rock-bed or the Northampton Sand, the ingenious maker having so arranged it that the flat striking end is formed out of the hard blue centre. It is 9½ inches by 4 inches, and the hole in the centre, which bears marks of having been worked from both faces, is 1¾ inches in diameter. The perforation of such holes must have been a work of long duration. It was probably accomplished by revolving a whetted stick in a kind of bow-drill or between the hands, and keeping the hole supplied with sand." This is also in the Museum. (See plate iii., fig. 9.)

PERFORATED HAMMER-HEADS, DISCS, AND SPINDLE-WHORLS.

A very fine, perforated, oval, hammer-head (similar to fig. 155, at p. 204, Evans' "Ancient Stone Implements"), formed from a natural pebble of quartzite, 4⅝ inches in length, 3½ inches in breadth, and 1¼ inches through the centre, with a hole, 1⅛ inches in diameter, formed by boring from each side, was found 12 feet from the surface in Wharf

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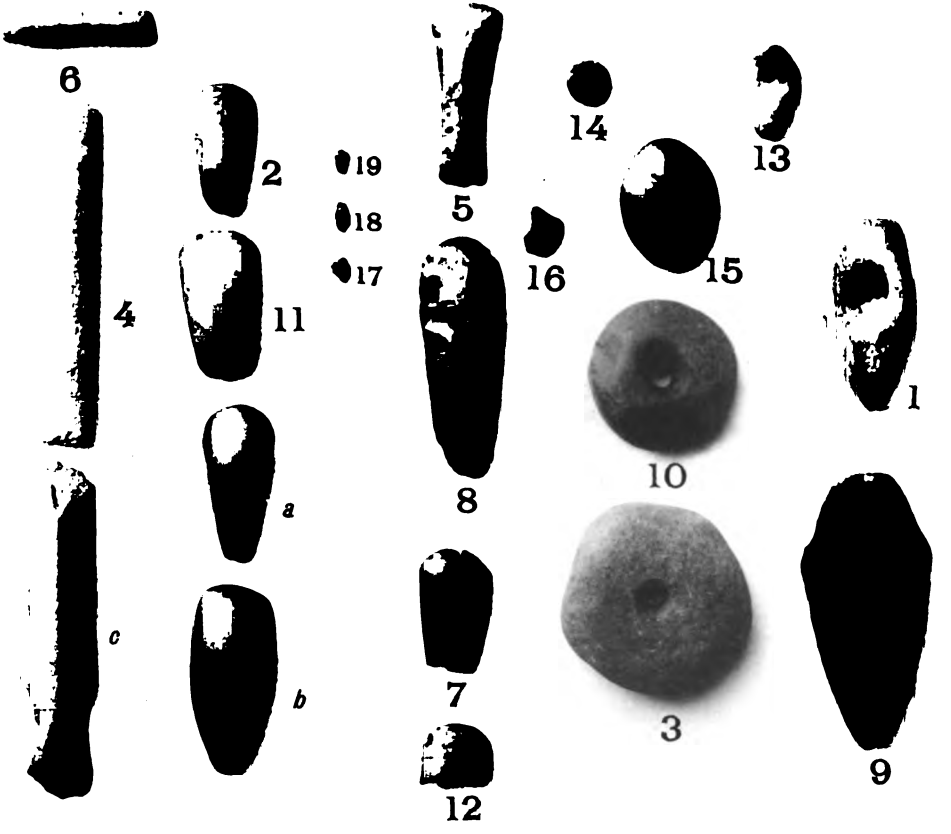

DIVISION IV.—STONE.—

PLATE III.

J. Fleming & Co., Collo-Type, Leicester.

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Street some years ago, and was presented to the Museum on 1st December, 1886, by Mr. W. Smith. (See plate iii., fig. 15.) It is exceedingly regular in shape and bears a high polish, and, although apparently not used, was most probably intended for a hammer-head or club-stone. and mounted in the manner of those nearly similar from New Guinea, presented in 1882 to the Leicester Museum.

A curious little implement, which it is difficult to classify, but which may have been intended for a perforated hammer-head, is shewn on plate iii., fig. 13. It is 3½ inches in length, 2 inches in breadth, about 1 inch in thickness, and has so small a hole that, although ½-inch wide at the surface, it will not admit of an ordinary pencil being passed through the centre. It is marked "Frisby, 1874," and came into our possession in 1885 as part of a collection bequeathed by the late Dr. Jno. Hunt, of Thurnby.

Mr. Harrison (p. 50) records the two following discs:—

"A stone disc from Bath Street, Leicester, is recorded as having been found under a Roman pavement. Its diameter is 6½ inches, by 2½ inches thick. The central perforation has been produced in a similar manner to that from Bottesford, but with probably less labour, as the material is a hard millstone grit." The Donation Book describes this as "Circular stone with perforated centre, found in Bath Street, Friars, 1860, under a Roman pavement." (See plate iii., fig. 3.)

The next, much smaller, "found near Bottesford, is formed out of a hard green basalt. The diameter is 5 inches, and the perforation varies from 2 inches on each side to half-an-inch in the centre. It has evidently been pecked out on both sides as far as possible, and then completely pierced by boring."

An interesting fact in connection with this, not recorded by Mr. Harrison, is related by John Biggs, whose marvellous memory constantly supplies the information necessary to identify an unlabelled or unrecorded specimen,* which is, that this specimen was brought to the Museum, about 1874, by the notorious "Flint Jack," who, however, repudiated the insinuation that he "made it himself," and stoutly maintained that he found it as one of the component parts of an ornamental "grotto,"

* Of the minor worries which attend the management of a Museum based upon amateurish notions of the value of collections of objects of the marine-store and "curio" type, not the least exasperating is the total disregard of the primary object of labelling, which is to give information and refer a particular object to a particular description. In the present case, these conditions have been violated to an extent which is positively puerile. Large paper labels have, it is true, been provided, but no provision has been made for the contingency of the label being disassociated from the object to which it referred, the consequence being that labels have been found in one place and the objects in another, or, worse still, an interchange of labels has taken place with disastrous results, and there are now quantities of beautiful objects which may be local, but are adrift from the labels, and are consequently of no value whatever. Had it not been for the measurements given by Mr. Evans, Mr. Harrison, and other observers, super-added to the phenomenal memory of John Biggs, this article could not have been written. The remedy for such a state of things would, or should, suggest itself to the meanest capacity, which is that the object *and its descriptive label* should bear a corresponding number in indelible ink. If that were done, the object might be in one room and the label in another, if it were so desired to add to the stupidity of the average "curiosity" Museum. I commend my remarks to Curators anxious to efface traditional blunders.

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and I think, from the condition and style of the specimen, there is every possibility of its being genuine. (See plate iii., fig. 10.)

A small, nicely-shaped specimen, apparently a spindle-whorl, convex on one side and flat on the other, came into our possession, in 1885, as part of the "Hunt bequest" (N.D.). It is rather more than $1\frac{1}{2}$ inches in diameter, by $\frac{3}{4}$-inch in thickness, with a perforation $\frac{3}{10}$-inch in diameter throughout, in this particular feature differing from all the preceding "bell-mouthed" examples recorded. (See plate iii., fig. 14.)

CELTS.

A fine specimen, which is fortunately preserved in the Museum, is first described among the objects exhibited at the Annual Meeting of the Leicestershire Architectural and Archæological Society, held on July 28th, 1857, as "Celt found in 1807, upon Ashby Woulds.—W. Dewes, Esq."

At page 298, Vol. I., "Transactions of the Leicestershire Architectural and Archæological Society," is given an account of it when exhibited again on February 28th, 1859, by the Rev. J. M. Gresley, to whom it was presented by Mr. W. Dewes:—"It was discovered about 50 years ago upon the Wolds, Ashby-de-la-Zouch, in the corner field where the lane to Blackfordby diverges from the Over Seile and Ashby turnpike road. It is of roughly chipped yellow flint, about $8\frac{1}{2}$ inches long, and 3 inches in the broadest part, which is near the semi-circular cutting edge, from whence it becomes narrower towards the star end, which is obtusely pointed; found unaccompanied by other remains." It was purchased at the sale of effects of the late Rev. J. M. Gresley, M.A., and is briefly mentioned by Mr. Harrison, at p. 49, who adds, "much discoloured by weathering." It may now be re-described as ochreous flint celt, $8\frac{1}{4}$ inches in length, ground at the cutting end, near which it is 3 inches in width, tapering from thence to $1\frac{1}{2}$ inches at the other end. (See plate iii., fig. 8.)

A greenstone celt, ordinary shape, not polished, was found at Ratcliffe, near Old Fosse Road, 1859. It is $4\frac{3}{4}$ inches long, and $2\frac{1}{4}$ inches wide at cutting end. "In its tapering form it resembles the Irish implements, and also those found in Brittany." (See Harrison, p. 49.) This is in the Museum. (See plate iii., fig. 2.)

The discovery of "a beautifully finished celt in flint, dug up on Battle Flat, on the property of Mr. Roby" (at Cliff Hill), was recorded in the Report of the Leicester Literary and Philosophical Society, for June, 1858. It was presented by the Misses Roby on 18th March, 1861, and is of rare shape of the Neolithic Period. It is of flint, finely flaked and polished, $6\frac{1}{2}$ inches in length, and varies in width from $1\frac{3}{4}$ inches at the butt to $2\frac{1}{2}$ inches at the cutting end (see Evans' "Ancient Stone Implements," p. 94; and also Harrison, p. 49). It is now preserved in the Leicester Museum. (See plate iii., fig. 5.)

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I have been so fortunate, owing to the measurements being given, as to find the portion of stone celt mentioned on p. 9.* It is 4 inches in length from the cutting edge, which is 2½ inches in width, and is shewn on plate iii., fig. 7.

I find in the "Transactions of the Leicestershire Architectural and Archæological Society," vol. ii., p. 275, that, at a meeting held on 30th November, 1863, the Rev. J. H. Hill exhibited a drawing of "a flint celt, found some time ago at Nosely, and now in the possession of Sir A. G. Hazlerigg, Bart."

Fig. 11, on plate iii., represents a greenstone celt, 5 inches long, 3 inches wide at cutting end, of ordinary shape, rather better worked, from Belgrave Gravel Pit, 1875. Presented by Mr. G. H. Nevinson to the Museum, where it now remains. (See Harrison, p. 49.)

Point of finely polished greenstone celt, broken at 2 inches from cutting end, which is 2½ inches in width; left at the Museum in 1885 by a youth unknown, who stated that he found it in Leicestershire. (See plate iii., fig. 12.)

It is recorded in the "Transactions of the Leicestershire Architectural and Archæological Society," vol. v., p. 296, that "At a meeting, held September 27, 1880, Mr. John Spencer exhibited a celt, found at Stoney Stanton, three feet and a half below the surface, when unbaring for granite." I have to thank Mr. John Spencer for his intervention with Mr. William Nixon, of Ullesthorpe, for the view of this celt, which is of unusual shape, being more suddenly tapering and more rounded at the small end than any other local ones I have seen. It is of syenite, 5½ inches in length, 2½ inches broad at the cutting end, and ⅞-inch at the small end. Mr. Nixon kindly furnishes the following information:— "It was found at Stoney Stanton, in digging a drain in a field at Orton's Hill, near to Margerison's Quarry ('Lane's Hill'), about 2 feet 6 inches from the surface of the ground. I cannot give you the exact date, but it is not more than fifteen years since. The man's name was Holland; old Jim Holland, his father, gave it to my late brother-in-law, W. Pegg, and at his death, in 1880, it was given to me." (See plate iii., fig. *a*).

I have again to thank Mr. Hicklin for allowing me to describe and figure the very fine celt shewn on the left hand of plate iii., fig. *b*. It is 6½ inches in length, 3 inches wide at cutting end, tapering to about 1 inch at small end. It is somewhat similar in shape to the other examples on the plate, with the exception that one face is more irregularly convex than the other. Owing to this reason, it is also much thicker than the other celts, being about 1¾ inches through. It was found in the Abbey Meadow, during the Flood Works Prevention Scheme, about 1881. Exceedingly new-looking, well polished, with hardly a blemish, and with the cutting edge in the most perfect order, without the faintest chip or scratch, it at first gave me the impression that it might not be

* Originally mentioned in the "Proceedings of the Society of Antiquaries," 2nd series, vol. i., p. 249, 1860; and also at p. 130, "Ancient Stone Implements, etc., of Great Britain" (Evans).

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genuine, but, as Mr. Hicklin assures me that he has no doubt upon the subject, having purchased it from two working men for the not very extravagant price of one shilling (!), we may at once assume that the labour expended in making so fine an implement would hardly be remunerated by such a sum; and although the edge is so exceedingly sharp and unchipped, this is not unusual, as most of the stone celts I have examined appear to keep their edges remarkably well. Mr. Hicklin is naturally very proud of his specimen, but he hints that some day he may add it and others to the Museum "local" collection. Mr. H. E. Quilter, who has examined it for me, pronounces it to be formed from a finely-banded slate, *exactly* of the appearance of some from Charnwood.

ARROW-HEADS.

None of the foregoing stone implements, it will be seen, were associated with the bones of Man, but Mr. Harrison records, at p. 49, that "A portion of the famous encampment on Burrow Hill was excavated by Mr. Hollings and other gentlemen in 1851. In the north-east corner of the vallum they found a skeleton, together with a flint arrowhead. This shows, with tolerable certainty, that the spot was the site of a British camp before it was used by the Romans." I do not know the ultimate disposition of this arrow-head; it is not in the Museum.

A beautifully chipped leaf-shaped specimen is recorded by Mr. Harrison (p. 49) as having been found near Burrow Hill, and he himself "found a well-barbed specimen on the Spinney Hills, near Leicester, and a large heavy one of somewhat unusual character from the summit of Mountsorrel. This was discovered under 7 or 8 feet of surface soil and *débris*, which had been cleared away preparatory for a blast."

SCRAPERS, SPALLS, AND FLAKES.

Three specimens of "scrapers," or thumb-flints, were found by Mr. Harrison on the Spinney Hills, and a specimen exactly resembling those from the Yorkshire Wolds, was found on the Dane Hills, near Leicester. A long, rather delicately worked flake which he obtained from Hutchinson's Gravel Pit, near Leicester, shows signs of use along the edge.* (See Harrison, p. 50.)

Quite recently, viz. on 19th July, 1888, I and a friend, whom I will call P., found four worked flints—three and one respectively—just under the turf, or within the humus, which overlies the Great Chalky Boulder-Clay, at Mr. Beasley's Pit, at Aylestone. These were submitted to Dr. Jno. Evans, F.R.S., who kindly examined them for me, and replied

* None of these last eight are in the Museum, and, therefore, I do not know on what grounds Mr. Harrison considered them all to belong to the *Neolithic* Period. I presume they were presented, because I find in the old Donation Book the following entries:—

Sept. 26, 1873.—Flint scraper found on the Spinney Hills, 1 foot deep; and well-chipped flake found in Hutchinson's Gravel Pit, Belgrave, 10 feet deep.—W. J. Harrison, Esq.

Jan. 2, 1874.—Flint scraper (Neolithic Period) found at Shoulder-of-Mutton Hill, 18 inches deep, Nov. 28, 1873.—Mr. J. R. Weatherhead.

May 7, 1874.—Fine flint javelin head. Summit of Mountsorrel, May 6.—W. J. Harrison, Esq.

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that the largest—an irregularly-shaped black flint, 1¾ inches in length, 1½ inches in width, and much abraded by use on its edge—was a "strike-a-light" (see plate iii., fig. 16), and he thought it might be modern. The three others, a spall and two small flakes (about an inch in length), the latter trimmed at their edges and bearing signs of wear, were, he wrote, probably Neolithic. (See plate iii., figs. 17, 18, and 19.)

FORGERIES.

It is recorded in the "Transactions of the Leicestershire Architectural and Archæological Society," vol. ii., p. 91, that, at a meeting held on 26th January, 1862, Mr. John Hunt exhibited "a flint arrow-head, curiously formed flints, apparently worked into shape for sling-stones, all found between Great Dalby and Burrow-on-the-Hill." The Museum became possessed, as part of the "Hunt bequest," of three sling-stones, a borer or drill, and five arrow-heads, being, probably, the specimens referred to above, together with others not mentioned; and with them I find a letter from Mr. Evans, addressed to Mr. Harrison, and dated March 16th, 1873, in which he says:—"I have no hesitation in expressing my opinion that the flints you send me are of recent manufacture, and are probably the work of 'Flint Jack.' Can they have been palmed off on Dr. Hunt by that arch impostor?"

The Museum possesses two black flints, worked on both sides and faces, leaving the outer crust remaining at the bottom, and, although skilfully managed, we know them to have been fabricated by the notorious "Flint Jack." They are very like some of those figured by Mr. Evans. The whole of these are, together with all the weapons, tools, and utensils of Pre-historic Man found in Leicestershire, and mentioned in the various Divisions of this Paper as belonging to the Museum, now deposited in the first Case on entry, in the middle of the Archæological Room of the Leicester Museum, and the small space they occupy will serve to remind friends in the County who may possess local bronze or stone celts, or flint implements, that, after all, the most fitting place for the preservation and exhibition of such interesting relics is the County Museum.

ACCIDENTAL FORMS.

This article would not be complete did I not call attention to the fact that many flints, quartzite pebbles, &c., are found closely resembling worked implements. In many instances these appearances are due to cleavage and chipping by the forces exerted in glacial times. In other cases they may be due to Man's indirect influence, being then purely accidental, and by this term, instead of natural, I prefer to describe them. My experience of these is somewhat singular, for after working many months at cuttings and pits, and gathering together an infinity of specimens which, misled by some similar ones in the Museum, I fancied might be Palæolithic, and which, indeed, I exhibited at a previous meeting of the Section as genuine implements, I have to confess, with

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much regret, my mistake, for the most promising ones turned out to be "accidentals," and there were only four amongst all the specimens I exhibited which were really flint implements, viz., those previously described. My disappointment is only alleviated by the doubtful consolation that, as I was the first to make the mistake, so was I the first to discover it. My apologies are therefore doubly due to those gentlemen whom I misled, and whom I have also deprived of the chastened joy of setting me right. The most striking of these "accidentals" have been retained, and are shewn as an "awful example," but are interesting as proving that, in many cases, Palæolithic and Neolithic Man found shapes ready to his hand, many of which hardly required any additional trimming and flaking to make them efficient implements.

Whilst this article was going through the Press, I have, curiously enough, discovered that these very singular natural or accidental forms have deceived others, for, with reference to an entry in the first "Museum Report," p. 15, of "Flint implements, tooth of rhinoceros, bones of deer, from the Drift of the Soar Valley.—W. J. Harrison and J. E. Elgood," I am informed by the latter gentleman that he and Mr. Harrison collected quite a quantity of these "flint implements," which were exhibited in the Museum for some time, until discovered to be "accidentals."

I find also, in the "Transactions of the Leicestershire Architectural and Archæological Society," vol. v., p. 79, a statement that, "At a meeting held September 24th, 1877, the Rev. W. H. Marriott exhibited a flint, partially worked, found on his glebe at Thrussington." Upon my writing to Mr. Marriott for particulars, he most kindly brought it and presented it to the Museum, where it is now shewn as No. $\frac{26}{a}$. It is a flint of a singularly honeycombed structure, but, needless to say, shews no signs of work. Mr. Marriott was, I believe, misled into shewing it, through the opinion of a local geologist who could not determine it.

Mr. Hicklin, previously mentioned, has also been misled by accidental forms, and has some hundreds collected which he imagined to be Palæolithic, but which I have no hesitation in pronouncing to be, like the preceding examples, accidental.

The last example was one kindly forwarded to me by Mr. Bernard Ellis, by whom it was found, and labelled "Flint flake, found at Wibtoft." It is of dark brown quartzite, and appears as if chipped to an edge all around, but is, undoubtedly, accidental. (Presented to the Museum, and marked $\frac{27}{a}$.)

With this the list closes for the present, no traces of Palæolithic Man having, as yet, been discovered in the County, and probably the explanation of our lack of Palæolithic implements is due to the causes mentioned by Mr. Deeley ("Pleistocene Succession in the Trent Valley," "Quarterly Journal of the Geological Society," 1886, pp. 467-8), who writes:—"I am inclined to believe that the Newer Pleistocene erosion, the traces of which are now to be considered, has been so great, and has been carried on so nearly along the lines of the

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old valleys, that not only have the Boulder-clays and associated deposits been removed, but the old river gravels which lay beneath them have shared the same fate." I would not, however, wish anyone to accept this as final, for, unless the Elephants and Rhinoceros whose remains we find, were never associated with Man in the Valley of the Soar, we may yet stand a chance of discovering Palæolithic implements. Indeed, Mr. Evans wrote (see Harrison, p. 48):—"It is by no means impossible that you may yet succeed in finding them. It is a little far north, but I doubt whether the glaciers persisted so long in that part of England as they did in the Lake District and in Wales."

I have, in conclusion, to record my very best thanks to Professor W. Boyd Dawkins, M.A., F.R.S., to Dr. Jno. Evans, M.A., F.R.S., and to A. W. Franks, Esq., M.A., F.R.S., for kind assistance in referring specimens for this article; as also my indebtedness to the authors of the various scientific works and papers quoted.

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ON CULTIVATION.

By F. T. Mott, F.R.G.S. (Read before Section "D," *July 25th, 1888.*)

Cultivation, applied to plants and animals, is the analogue of education applied to Man. It is the drawing out or unfolding of hidden potentialities. Neither education nor cultivation can impart any new faculty, but the changes which they are able to bring about under the guidance of human reason are very remarkable. The difference between the wild *Brassica oleracea* and the garden Cabbage, with its white and succulent heart, is as great as between a black savage and a European philosopher. No one ignorant of botany would suppose them to be the same species.

The business of the school-master is to discover the natural bent of each pupil's mind, and to draw him out to the utmost in that direction. The business of the cultivator is to observe the various tendencies of vegetable organs, to recognize those which may be made to minister to human wants, and to find out what conditions will give these special tendencies the opportunity of development.

There is scarcely any one of the organs common to plants which has not in some case been improved for man's benefit by the process of cultivation,—the root in the carrot, the rhizome in the potato, the stem in asparagus, the leaf in cabbages, the involucre in the globe artichoke, the corolla in countless garden flowers, the stamens in saffron, and the seed-vessel in innumerable fruits.

Where the object is to increase the quantity of human food, those organs must be selected and acted upon which show a tendency to the deposit of starch, sugar, gum, or albumen. These deposits are reserves of food for the plant itself during the changes of seasons, or for its offspring. By supplying it with ample material, and removing the causes of exhaustion, we may induce it greatly to extend these deposits, and we then appropriate them to our own use, as we take the honey from the bee-hive. When the object is not only to increase the quantity but also the flavour of the food, in order to gratify man's desire for the agreeable, it is necessary to discover tendencies to the secretion of ethers and essential oils, and to find the conditions which favour these secretions.

In order to enrich the splendour of our gardens and thus gratify man's taste for the beautiful, the cultivator has two methods open to him, and both are largely used. He can either take some common weed, such as *Dianthus plumarius* or *Viola tricolor*, and by selection and high feeding and hybridization cause the corolla to grow more luxuriantly, to vary

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more widely in its colouring, and to intensify all its hues by the production of a larger quantity of protoplasm,—and we see the effect of such cultivation in the beautiful Pinks and Pansies of modern gardens; or he can import species whose corollas are already more developed than is common in this country, and adapt them by gradual hardening to our climate if it is not already suitable to them. Either the climate of England is not favourable to the development of showy corollas among wild plants, or the geological history of this island has not given our wild weeds time enough, or possibly our flower-loving insects are not so artistically gifted as those of some other regions. A large number of the most showy flowers in the world are Alpines; another large group are from the warm and sunny Mediterranean basin; another from the dry rocks of the Cape of Good Hope. The climate of England is comparatively moist and sunless, and these conditions favour the development of foliage rather than of blossom.

The increase in the total volume of food due to cultivation must be something enormous. The wild *Ægilops ovata*, the Sicilian grass supposed to be the origin of wheat, bears about half-a-dozen small grains on each head, while a good ear of wheat may bear 50 grains at least twice the size. Here is a multiplication of the quantity by 100, but as the area of wheat land in England alone is some 3,000,000 acres, while *Ægilops* itself is not found in this country, the actual increase of this one article throughout the world is almost incalculable. The tap-root of the wild carrot, *Daucus carota*, is hard and woody in its natural state, with only a slight tasty sweetness in the outer skin. But its natural use as a store-place for starch, sugar and albumen has been taken advantage of by man. He has taught the plant to increase its store a thousand-fold, and now gets from it ten tons of useful food to the acre of land. Man without the art of cultivation could not exist on this earth except as a semi-savage, and in small numbers. Vegetable food, as well as animal, is essential to civilization, and Nature does not supply such food except at certain seasons, and in very limited quantity.

In relation to this subject, a curious question presents itself, arising out of the extraordinary results of modern Chemistry. Fifty years ago it was thought impossible to manufacture synthetically any organic substance. But the possibility has been proved, and the field now open to the chemist offers wealth and fame to the successful discoverer of cheap methods by which food may be artificially produced from its inorganic elements.

When starch, albumen and essential oils are thus supplied, agriculture will be regarded as a clumsy device of semi-barbarous times, and the land, set free from the plough, may be devoted to orchards, flower gardens, and parks, whereby Man's more delicate tastes may be gratified, and his delight in beauty, which is the crown of his intellectual life, expanded and developed. When the cultivator devotes his skill to these high objects he will have reached the climax of his art.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

This Section has not met during the past Summer Quarter.

A. H. PAGET, *Chairman.*

SECTION "C."

FOR GEOLOGY.

This Section has not met during the past Quarter.

C. A. MOORE, *Chairman.*

"SECTION D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

June 20.—The CHAIRMAN reported that at the Field-day on the 13th, six members visited Swithland Wood, but it was very wet and little was done.

A rather rare Moss *Brachythecium albicans* was found, and it was observed that the foliage of the oak trees was much ravaged by caterpillars. The members were very hospitably entertained by the Rev. T. A. PRESTON, of Thurcaston Rectory, in whose interesting old garden *Anthriscus cerefolium* was found as a casual weed, an unbelliferous plant new to the County.

Mr. KNOWLES called attention to the brown and shrivelled appearance of the leaves of damson trees at Syston. Dr. FINCH had observed the same thing on the damson trees at the Asylum.

Exhibits.—By Mr. HEADLY, spray of the variegated Negundo Maple.

By Mr. TURNER, a curious shoot of *Asplenium Ceterach*, from a root growing in his greenhouse and brought three years ago from Abergavenny.

By the CHAIRMAN, a number of garden flowers.

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Paper.—Dr. FINCH, through a misunderstanding, was not prepared to read his paper.

Discussion, on the question "What causes the change of the Caterpillar into the Butterfly?" The CHAIRMAN said this change was perhaps not more mysterious than the change of a seed into a plant, but it had this peculiarity, that it was the metamorphosis of an actual living and moving animal, not a reproductive process, nor a vegetative growth, but a simple change from one form into another, as extraordinary to all appearance as if a dog were to change into a cat. Mr. COOPER suggested the analogy of the leaf and the flower. Mr. HEADLY stated that rudiments of the new organs can be traced in the caterpillar just before it assumes the pupa state. The CHAIRMAN thought these changes could not be explained by any materialistic theory.

July 25th.—The CHAIRMAN reported that the monthly Field-day had been merged in the general Excursion of the Society, which took place on the 18th, when, chiefly owing to the unsettled weather, a party of only twenty visited Groby, Bardon, Abbot's Oak and Gracedieu.

Exhibits.—By the CHAIRMAN, a simple apparatus of wood, vertical with horizontal arms, marked with scales of inches and fractions for measuring the daily growth of plants.

A *discussion* ensued as to the effect of light upon vegetable growth. Dr. FINCH stated on the authority of Sachs that the shaded side of herbaceous stems grows faster than the sunny side, and that this is the cause of heliotropism, and of the fact that plants grow more in the night than in the day.

The CHAIRMAN said that heliotropism might be caused, as the closing of leaves at night is, by a movement in the liquid contents of the cells and an accumulation of it in those on one side only; and that the greater growth of plants at night was probably due to the fact that they were engaged during daylight in absorbing carbon from the air, which was chiefly converted into cellulose during the night.

The CHAIRMAN also exhibited a number of garden flowers, among them being *Salvia argentea*, *Echinops sphærocephalus*, *Gaillardia aristata*, and *Spiræa oblongifolia*.

By Dr. FINCH, specimens of *Crassula lycopodioides*, *Carex paniculata*, *Viola lactea*, *Aponogeton distachyon*, &c.

By Mr. CARTER, *Cardamine impatiens*, which occurred as a casual weed at Knighton, and was new to the County.

By Mr. PALMER, fine specimens of *Planorbis corneus* and *P. Carinatus*.

Paper by the CHAIRMAN, on "The Results of Cultivation."

The Section did not meet in August.

F. T. MOTT, *Chairman.*

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SECTION "E."

FOR ZOOLOGY.

June 11th.—A paper was read by Mr. MONTAGU BROWNE, F.Z.S., entitled "Some Notes upon the Remains of *Cervidæ* found in Leicestershire," which will be found embodied in the paper printed at pages 7-37 of this number of the Transactions.

Objects Exhibited.—A number of remains of *Cervidæ* and *Bovidæ*, from various excavations in the County, by Mr. MONTAGU BROWNE.

July 2nd.—An excursion to Brooksby and neighbourhood was arranged for Saturday, July 28th.

A paper was then read by Mr. H. E. QUILTER, entitled "Monophyletic and Polyphyletic Descent." The CHAIRMAN and Messrs. BROWNE and VICE took part in the discussion which followed.

Mr. MONTAGU BROWNE exhibited a series of supposed Palæolithic flint implements from the County, and made some remarks thereon.

August 11th.—The excursion to Brooksby, originally arranged for July 28th, was unavoidably postponed owing to the bad weather which prevailed on that day.

Saturday, August 11th, proved dull and threatening, and, in consequence, only a few members turned up at the Railway Station. Those who went, however, enjoyed a pleasant afternoon and evening, returning to Leicester on foot by way of Thrussington, Ratcliffe, and Thurmaston. Though a fair number of specimens was obtained, nothing of special note was seen nor captured.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1888.
Oct. 8.—PRESIDENT'S Address—"Oliver Wendell Holmes."
,, 22.—Professor WILLIAM KNIGHT (St. Andrew's University)—"The Classification of the Sciences."
Nov. 5.—Rev. T. A. PRESTON, M.A.—"The Potato."
,, 19.—Rev. Canon AINGER, M.A.—"Wordsworth and Coleridge's Lyrical Ballads, 1798."
Dec. 3.—C. J. BILLSON, Esq., M.A.—"Matthew Arnold."
,, 17.—Rev. W. H. DALLINGER, LL.D., F.R.S.—"Contrasts in Nature: the Infinitely Great and the Infinitely Little." (Illustrated by Transparencies drawn from Nature.)

1889.
Jan. 7.—Rev. J. P. O. TOMPKINS, M.A.—"Wordsworth as a Teacher."
,, 21.—M. L. LEWIS, Esq., M.A., LL.M.—"Robinson Crusoe."
Feb. 4.—Professor HENRY MORLEY—"The Right Reading of Books."
,, 18.—H. J. MACKINDER, Esq. (Reader in Geography in the University of Oxford)—"Geography *and* Geography."
Mar. 4.—Captain W. DE W. ABNEY, C.B., F.R.S.—"Colour Measures." (Illustrated with Experiments.)
,, 18.—G. H. NELSON, Esq., M.A.—"John Ziska."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—A. H. PAGET, West Walk.

Secretary—JOHN SCAMPTON, 1, Pelham Street.

The Meetings will be held in the Council Room, Town Museum, at 7 p.m., on the third Tuesday in each month.

1888.
Oct. 16.—Mr. A. H. PAGET—"The Beaumonts of Gracedieu."
Nov. 20.—Mr. WM. JACKSON—"Sartor Resartus."
Dec. 18.—Mr. A. P. MOORE, M.A.—

A. H. PAGET, *Chairman.*

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SECTION "C."

Chairman—C. A. MOORE, M.D., New Walk Gates.

Secretary—LOUIS HODGES, St. Martin's Schools.

This Section meets on the second Thursday in each month, at 7.30 p.m., in the Council Room, Town Museum.

C. A. MOORE, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, F.R.G.S., Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 3, St. Stephen's Road, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

1888.

Oct. 17.—This evening will be devoted to the study of *Amphibians* and *Reptiles*. Members are requested to bring specimens and books relating to these Orders; also written lists of all the species which they have reason to believe are indigenous to Leicestershire, and written notices of any interesting facts relating to any species, British or Foreign, of which they have personal knowledge. At the close of the meeting, some member will be appointed to prepare a paper on "The Amphibians and Reptiles of Leicestershire."

Nov. 21.—Paper on "The Amphibians and Reptiles of Leicestershire."

The remainder of the evening will be devoted to the study of *Ferns*. Some member will be appointed to prepare a paper on "The Ferns of Leicestershire."

Dec. 19.—Paper on "The Ferns of Leicestershire."

The remainder of the evening will be devoted to the study of *Fishes*. Some member will be appointed to prepare a paper on "The Fishes of Leicestershire."

There will be opportunity on each evening for the introduction of any additional subject which any member may desire to bring forward.

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—F. M. POPE, M.D., Campbell Street.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1888.

Oct. 15.—Paper by the CHAIRMAN on "Animal Heat."

Mr. G. H. STORER will exhibit a series of Blind Worms (*Anguis fragilis*) from the County (living specimens and spirit preparations).

Nov. 12.—Paper by Mr. G. H. STORER—"Notes upon the Habits, &c., of our British Song Birds, with special reference to those found in Leicestershire." (Illustrated by skins and eggs of various species.)

Dec. 10.—Notes and Exhibits by various Members.

The paper for the Evening will be read at 7.45; any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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OF THE

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LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART X., JANUARY, 1889.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
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[*Price Sixpence.*]

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1888-89.

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REV. A. P. DAWSON, M.A.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
A. H. PAGET.
GEORGE STEVENSON.

Council:

Retiring June, 1889.	Retiring June, 1890.
H. BILLSON.	R. HARVEY, LL.B.
E. F. COOPER, F.L.S.	C. W. COOPER, M.B.
T. CARTER, LL.B.	W. KELLY, F.S.A., F.R.H.S.
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Corresponding Secretary, C. J. BILLSON, M.A.
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Minute „ W. SIMPSON, Junr.

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Auditors:

E. CLEPHAN. T. C. LEE.

Four Co-optative Members of the Museum Committee of the Town Council, recommended by the Society.

H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.

Sections:

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Chairman, A. H. PAGET.
Secretary, JNO. SCAMPTON.
1, Pelham Street.

C. GEOLOGY,
Chairman, C. A. MOORE, M.D.
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St. Martin's Schools.

D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, F. T. MOTT, F.R.G.S.
Secretary, J. J. W. KNOWLES,
St. Stephen's Road

E. ZOOLOGY,
Chairman, F. M. POPE, M.D.
Secretary, F. R. ROWLEY.
Town Museum.

Number of Members, 1887-88.

Subscribing 271, Associates 25, Honorary 22.—Total 318.

General Meetings.

Fortnightly, on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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Session 1888-9.

OCTOBER—DECEMBER, 1888.

GENERAL MEETINGS.

October 8th, 1888.—Inaugural Address of the PRESIDENT (Rev. A. P. DAWSON.) Subject: "Oliver Wendell Holmes."

The PRESIDENT, in his introductory remarks, drew attention to the fact that instead of giving an "address" on a general topic in accordance with the custom of some of his predecessors, his inaugural remarks came more properly under the category of "lecture." He then referred to the recent departures in the working of the society by which ladies were admitted as full members of the society, gentlemen could become associates, having the privilege of attending the meetings, and ladies and gentlemen might belong to the recently revived sections without being members or associates of the society. Passing on to the subject of his lecture, the President remarked that it was often said, and with truth, that it was hard, if not impossible, to make a calm, unbiassed, and thorough estimate of a man till some time after he had passed away. But when a person was known to them chiefly by his writings, and had entered upon his 80th year, it was reasonable to suppose that he had told them nearly all he intended to tell them. He therefore made no further apology for speaking about Wendell Holmes from the point of view of a humble and loving disciple. Beginning with the last production of the pen of Holmes, his "Our Hundred Days in Europe," the lecturer drew attention to some of the leading thoughts in it, remarking that in common with all good Americans the poet loved and reverenced the dear old mother country, with her quiet charm and her noble antiquities, which he envied, and her ancient institutions, at which, thorough-going Republican as he was, he cast a lingering and almost regretful look. Although the foundation of the American creed was that all men were on a par, yet it had often been remarked that the Transatlantic professor of equality had generally a keener appreciation of the virtue of an inherited high station than even the most aristocratic-tempered of Englishmen, and Holmes seemed to be inwardly rather proud of coming into familiar contact with some of those in this land who were born great—among those mentioned being the Prince of Wales and Prince Christian. Holmes was born in 1809, and was very proud of his birth year, which was also that of Gladstone, Tennyson, Lord Houghton, and Darwin. He graduated at Harvard College in 1829, and his year was most fortunate in being one which

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included an exceptionally brilliant set of classmates, who helped to warm and brighten each other's intellectual and human sympathies. Before he was a prose writer he was pretty well-known in America as a writer of short poems, mostly of ephemeral interest, and with no claim to poetry of a high order. Though he (the President) held Holmes as a poet, he thought his poetry was much more abundant in his prose writings than in his verses. America was peculiarly a land for short poems. No academic or national festival there was complete without an ode or a hymn, and many of Holmes's casual poems were prompted by an American custom by which college classmates who had graduated in the same year thenceforth held annual meetings at which speeches and songs abounded. Holmes had read no less than 40 poems at those successive yearly gatherings. The lecturer then quoted a characteristic poem to show his author's happy knack of putting things well, and also his Wordsworthian power. He was a true lover of Wordsworth—of drawing deep lessons from most simple things. His literary life had been comparatively a short one, because until he was about 46 years of age he was occupied with other duties, and since he seriously entered the profession of authorship his works had not been voluminous. Those best known were the threefold series called respectively the Autocrat, the Professor, and the Poet of the Breakfast Table, which, however, were the revival of the same papers commenced 25 years before in the *New England Magazine*, and under that threefold title Holmes was his own Boswell. He did not mean that Holmes told them any facts of his life, but evidently, in each of the series, he intended the reader to understand that he himself, in the person of the supposed author, gave them his best thoughts and conclusions, and his personality pervaded the volumes. Holmes had also written three romances, not so well-known as the Breakfast Table series—"Elsie Venner," which first appeared under the name of "The Professor's Story," "The Guardian Angel," and "A Mortal Antipathy." The personality of the author pervaded also that series. In addition he had published various pamphlets and a charming biography of Emerson. As to the main teaching of Holmes, the thing that first struck him (the President) was that he was chiefly interested in man, in his manners and character, and that he encouraged a most hopeful and healthy, a most kindly and genial view of human life. He seemed to consider the life of man from a double point of view—from that of a doctor, and from that of a theologian. For Holmes, although he was so playful, was always, even in his lightest moments, a most earnestly religious man. No one could tell from his writings to what denomination of Christians Holmes belonged. But if, as Matthew Arnold often insisted, three-fourths of religion was conduct, he thought it followed that an earnest thoughtful man who wrote about human nature, and hence mainly about human conduct, must to a very large extent deal with religion. As regarded his definite creed he gloried in its simplicity. In his leading thought he was evidently profoundly impressed with the immense power of inherited moral tendencies and of the limitation of the human will. If there was

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one conviction that seemed to possess Holmes it was that in estimating the faults and failings of others, they generally failed, at any rate in practice, to make anything like sufficient allowance for inherited moral tendencies and the limitations of the human will. His trilogy of novels was written mainly to enforce that conviction, and the same kind of spirit, to a very large extent, was to be found in the Breakfast Table series. When Holmes was a young man Boston was trying to free itself from the meshes of an unlovable form of Puritanism, and no estimate of him would be adequate which did not take his position in that matter into account. Holmes had taken a leading part in humanising the deepest thoughts of co-patriots and fellow-citizens. He had in "The Guardian Angel" a delicious description of an old minister, bred in the old and narrow school, who was searching for a larger home almost without being aware of it. Myrtle Hazard, the brave little heroine in "The Guardian Angel," was brought up by two old maiden ladies, who started from the approved doctrine that all children were radically and utterly wrong in all their motives, feelings, thoughts, and deeds, so long as they remained subject to their natural instincts. It was by the eradication, and not the education, of those instincts, that the character of the human being they were moulding was to be determined. That was not Holmes's view of the process of youthful education. His own view of the process might be gathered from this extract—"Look at the flower of a morning-glory, the evening before the dawn which is to see it unfold. The delicate petals are twisted into a spiral which, at the appointed hour, when the sunlight touches the hidden springs of its life, will uncoil itself and let the day into the chambers of its virgin heart. But the spiral must unwind by its own laws, and the hand that shall try to hasten the process will only spoil the blossom, which would have expanded in symmetrical beauty under the rosy fingers of morning." They might take a hint from nature's handling of the flower in dealing with young souls, and especially with the souls of young girls. The two old spinsters tried to educate their charge by "untwisting the morning-glory" without waiting for the sunshine to do it. The result was she asked, "Is it wicked in me to live?" Her whole theological training was contained in that brief question. But Holmes was a many-sided man. There was hardly anything he had not touched, there was nothing that he had touched that he had not adorned. He (the lecturer) had written of him most as a philosopher addressing chiefly his own countrymen, but in a manner not altogether unprofitable to them.

October 22nd, 1888.—Professor Wm. Knight (St. Andrew's University) on "The Classification of the Sciences." (Professional.)

November 5th, 1888.—Rev. T. A. Preston, M.A. on "The Potato."

He said, although more extensively cultivated than any other plant in England, the potato was not a native of England, but of America. In 1565 it was introduced into Ireland, and 20 years later was brought into

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England by Sir F. Drake, and really introduced a year afterwards by Sir Walter Raleigh. Although it had been known in England for 300 years, it did not become popular until the end of the last century, thus taking no less than 200 years to have its claims properly appreciated. Perhaps that was not to be wondered at. Cultivation and cooking were both necessary for the potato to be appreciated, and in both the English of that time were inefficient. In England now they had more than half-a-million acres planted with potatoes every year, but abroad there was an infinitely larger quantity grown. In England the plant was grown mainly for food, but every part of it could be turned to some use. The lecturer with the aid of a number of diagrams, explained some of the diseases peculiar to the potato, and the measures best calculated to check them, and then passed on to an analysis or explanation of the potato, what it was capable of producing, and the many uses to which it was put in manufactures. Considerable time was taken up in dealing with the starch yielded by the potato, and some amusement caused when it was pointed out what an important part it played in arrowroot, sago, &c. It was evident that the lecturer was master of his subject, and during an hour and a half he gave some very useful information about a plant, the uses of which, apart from those of diet, are so numerous and varied.

November 19th, 1888.—Rev. Canon AINGER, M.A., on "Wordsworth and Coleridge's Lyrical Ballads, 1798." (Professional.)

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THE BEAUMONTS OF GRACEDIEU.

By A. H. Paget. (Read before Section "A.")

The following lines, descriptive of Gracedieu, are among the Miscellaneous Poems of Wordsworth :—

"GRACE DIEU.

"Beneath yon eastern Ridge, the craggy Bound,
Rugged and high, of *Charnwood's* Forest ground,
Stand yet, but, stranger! hidden from thy view,
The ivied Ruins of forlorn Grace Dieu;
Erst a religious House, which day and night
With hymns resounded, and the chanted rite;
And when those rites had ceased, the spot gave birth
To honourable men of various worth.
There, on the margin of a streamlet wild,
Did *Francis Beaumont* sport, an eager child;
There, under shadow of the neighbouring rocks,
Sang youthful tales of shepherds and their flocks;
Unconscious prelude to heroic themes,
Heart-breaking tears and melancholy dreams
Of slighted love, and scorn, and jealous rage,
With which his genius shook the buskined stage.
Communities are lost, and Empires die,
And things of holy use unhallowed lie;
They perish—but the Intellect may raise
From airy words alone, a Pile that ne'er decays."

Nichols's "History of Leicestershire" says that Gracedieu Nunnery was founded between the years 1236 and 1242. Potter, in "Charnwood Forest," gives the date explicitly as 1240. The period, then, is about 650 years, in the reign of Henry III. The Foundress was Roesia de Verdun, widow of Theobald de Butiller, and the dedication was to Saint Mary and the Holy Trinity, *de gratia Dei*. The house was for Nuns of the Order of Saint Austin, and is said to have been richly endowed.

The first Prioress was Agnes de Gresley, and she was soon followed by Mary de Stretton. We may notice that both bear names of villages at no great distance from Gracedieu. In 1243 the Prioress gained leave to establish a market and fair at Belton, the Nunnery being in Belton parish. In 1277 Belton Church was appropriated to the Nunnery by the Archbishop of Canterbury, and John Comin, Earl of Buchan, and others, made benefactions to Gracedieu.

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The date of Roesia's death is not stated by Nichols. Potter gives it as 1247. She was buried in the chapel of the Priory; and three centuries afterwards, at the Reformation, a fine effigy, said to be that of the Foundress, was removed to Belton Church. It probably remains there to this day. Nichols gives a drawing of it, and describes the figure as being "in a close veil head-dress, wimple, close plaited gown girt round her waist, and over it an elegantly folded mantle, gathered up below in graceful folds by the left hand, which holds a book."

Passing at a bound from the early days of the Priory to the last, we find that, under Henry VIII., on January 30, 1535, John Beaumont, of Thringston, was appointed by the King's writ to be ecclesiastical surveyor for the County of Leicester. Nichols quotes the following as an extract from a report by Beaumont:—

"This house standeth low in a valley upon a little brook in a solitary place, compassed round with an high and strong stone wall, within which the nun's had made a garden, in resemblance to that upon Mount Olivet, Gethsamane, whither Christ, with Peter, James and John, (a little before he was betrayed) went up to pray."

The surveyor compares this to a place called Sinai, formed by the Abbot of Burton, not far from his Abbey.

Gracedieu was suppressed with the smaller religious houses in 1536. For three years the inmates were allowed to linger within the walls; and the actual surrender took place on October 27th, 1539. The monks of Ulverscroft had a similar term of grace accorded to them.

The last Prioress was Agnes Litherland. Besides herself, the Convent then held a sub-prioress and fourteen nuns.

We have now before us the earliest Beaumont who figures in the history of Gracedieu. Would that the family had descended from a more worthy source!

It was afterwards suspected that John Beaumont had all along designed the Gracedieu property for himself; and, as surveyor or commissioner, had so ordered matters as to ensure his obtaining it. The report upon the Nunnery was inaccurate in some matters of fact, and certain charges brought against the inmates may have been lodged with a view to damage the reputation of the house, and hasten its fall. The valuation of the estate was considered far below its real worth. These sinister surmises lead up to the fact that the very day after the surrender by the Prioress the estate passed into the hands of Beaumont, although, in the mean time, another man had obtained a grant of the property; his name, it was alleged, being a mere blind to mask a piece of jobbery in Beaumont's favour.

Nichols quotes a long and curious inventory of the effects sold by the commissioners to Beaumont. This comprises church ornaments, vestments, furniture, agricultural implements, and grain in store.

The later career of this man goes to deepen our suspicion of his dishonesty. In 1541 the Earl of Huntingdon threatened his possession of Gracedieu, and Beaumont had to defend his title, and seems to have

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made good his claim. He was a lawyer, and, in 1550, he became Recorder of Leicester, and in the same year was made Master of the Rolls. But two years later he was removed from office, charged with having scandalously abused his position; and Beaumont then surrendered Gracedieu and other estates. The Earl of Huntingdon then became possessed of the Manor of Gracedieu; and Beaumont died a year or two afterwards. But his widow, within five years of his death, recovered possession of the estate; and Huntingdon confirmed the title to herself and her heirs.

Francis Beaumont, the heir of this John, who succeeded to the estate on the death of his mother, became judge of the Court of Common Pleas in 1593. He died at Gracedieu, April 22nd, 1598, and was buried in Belton Church. He was never knighted, always remaining an esquire. He left three sons, Henry, John and Francis.

The eldest son, Henry, was sixteen years of age when his father died. He was afterwards knighted by James I., when that King journeyed south to assume the English crown, in 1603. He died in 1606. A daughter was subsequently born, but the estate passed to the second son of Francis Beaumont, the judge, namely, John. This second John Beaumont was created a baronet in 1626, and died two years later. He was famous as a soldier, and achieved a name as a poet. He translated from Virgil, Horace, Juvenal, and other Latin writers; wrote religious and moral poems, and, after the fashion of the day, complimentary verses to royalty. He is the author of a descriptive poem on the Battle of Bosworth Field, written in rhymed ten-syllable verse, which Nichols inserts at length. His works were published in the year of his death by Sir John Beaumont, his son, third of the name and second baronet. This man, too, was a poet, and had a special reputation for personal strength and agility. In the Civil War he fought with the Royalists, and was killed at the Siege of Gloucester, in 1644.

The third son of the judge Francis was the famous dramatist, Francis Beaumont, the colleague of John Fletcher. He was born at Gracedieu in 1586. In 1596 he and his two brothers were admitted gentlemen commoners of Broadgate Hall, Oxford, now Pembroke College. Francis afterwards studied at the Inner Temple; and his "Masque of the Inner Temple and Gray's Inn," acted and printed 1612-13, when he was in his twenty-sixth year, associates his name with lawyers and their communities.

At this time he was a regular dramatist, and had collaborated with Fletcher since 1607. The partners are said to have lived together in the closest intimacy on Bankside, among the southern playhouses. Judging by the amount of work produced in a short space, they must have possessed marvellous fertility and industry. The share of each in the joint work is matter of uncertainty. Fifty-two plays are popularly assigned to Beaumont and Fletcher. Beaumont seems to have been writing nine years, and Fletcher survived him another nine years.

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Francis Beaumont was only thirty when he died on March 6, 1616. His death took place in London, and he was buried in the entrance of Saint Benedict's Chapel, in Westminster Abbey. Shakespeare, born twenty-two years before Beaumont, in the adjoining county, died seven weeks later. The dramatist left an only child, a daughter, who lived to an advanced age, and died in Leicestershire early in the last century.

As in the case of Shakespeare, many of the plays of Beaumont and Fletcher were printed separately in quarto during their lives. But some of them never appeared in this form. The first collection of the plays was issued by a man named Shirley, in 1647, after the closing of the theatres by the Parliament. It was in folio, and contained thirty-four plays that had not been printed in quarto, and no others. It opened with a dedication to the Earl of Pembroke, signed by ten actors whose occupation was, for the time being, gone. Among them was Joseph Taylor, who is generally considered to have been the original Hamlet, instructed by Shakespeare himself. Thirty years afterwards, in 1679, a second folio was produced; and now seventeen plays were added to those comprised in the first issue, these having been collected and re-printed from the old quartos. Later editions appeared in 1711 and 1750.

Gerard Langbaine, the quaint old historian of the stage, writing in 1691, says:—

"I am now arrived at a brace of Authors, who like the Dioscuri, Castor and Pollux, succeeded in conjunction more happily than any Poets of their own, or this Age, to the reserve of the venerable Shakespear, and the learned and judicious Johnson. . . . . To speak first of Mr. Beaumont, he was Master of a good wit, and a better Judgment; and he so admirably well understood the Art of the Stage, that even Johnson himself thought it no disparagement to submit his Writings to his Correction. What a great Veneration Ben had for him, is evident by those Verses he writ to him when living."

"*To Mr. Francis Beaumont* (then living).

"How I do love thee, Beaumont, and thy muse,
That unto me dost such religion use!
How I do fear myself, that am not worth
The least indulgent thought thy pen drops forth!
At once thou mak'st me happy and unmak'st;
And giving largely to me, more thou tak'st.
What fate is mine, that so itself bereaves?
What art is thine, that so thy friend deceives?
When even there, where most thou praisest me
For writing better, I must envy thee.

"(Ben Jonson.)"

The writer in the "Dictionary of National Biography" speculates that Beaumont sometimes brought Fletcher to Gracedieu, and believes that a famous letter in verse by our poet to Ben Jonson was sent from this place. He there speaks of himself as being in the country, away from the delights of London:—

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"In this warm shine,
I lie, and dream of your full Mermaid wine.
Oh, we have water mixed with claret lees,
Drink apt to bring in drier heresies
Than beer, good only for the sonnet's strain,
With fustian metaphor to stuff the brain.

And again,

"What things have we seen
Done at the Mermaid! heard words that have been
So nimble, and so full of subtile flame,
As if that every one from whence they came
Had meant to put his whole wit in a jest,
And had resolv'd to live a fool the rest
Of his dull life."

Langbaine cites an epitaph by Bishop Corbet, a contemporary writer of verse, who deplores and explains the untimely death of the dramatist:—

"ON MR. FRANCIS BEAUMONT.

"*(Then newly dead.)*

"He that hath such acuteness, and such wit,
As would ask ten good heads to husband it;
He that can write so well, that no man dare
Refuse it for the best, let him beware;
BEAUMONT is dead, by whose sole death appears
Wit's a Disease consumes men in few years."

Three sketches have been published of the ruins of Gracedieu. Nichols gives two little wood-cuts, one from a drawing taken in 1730, and the other from a drawing made in 1794. Portions of the ruins seem to have disappeared between these two dates. Mention was made in 1645 of a "court of cloisters" standing there, and a hall. So the buildings have vanished by degrees. A third drawing was made, perhaps fifty or sixty years ago; and in no one of these drawings can I recognise the features shown in either of the others. The two older ones are very small and rude; the third is by John Flower, and no doubt this is a truthful representation of Gracedieu at the time he drew it, as well as a very pleasing picture.

The lines by Wordsworth, with which I began, show how he associated religion and poetry with the name of Gracedieu. So, too, did Thomas Bancroft, who, in 1639, made this place the subject of a glowing rhapsody:—

"Gracedieu, that under Charnwood stands and alone,
As a grand Relicke of Religion,
I reverence thine old (but fruitfull) worth
That lately brought such noble Beaumonts forth.
Those brave heroic Muses must aspire
To match the anthems of the heavenly quire.
The mountains crowned with rocky fortresses
And sheltering woods secure thy happinesse,
That highly-favoured art, though lowly placed,
Of Heaven, and with free Nature's bounty graced."

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PHANEROGAMOUS PARASITES OF LEICESTERSHIRE.

By Thomas Carter, LL.B. (Read before Section "D.")

The curious abnormal growth of parasitical plants attracted the notice of naturalists from very early times. Their peculiar structure, colour, and habit of life occasioned strange speculations. Many regarded them, not as independent plants, but as morbid, metamorphosed or degenerate products of the plants on which they grew. Pliny was one of the first to record his observation of the real nature and independent growth of the Mistletoe. The false theory found adherents as late as the end of the 18th century. One botanist attempted to prove, on anatomical principles, the outgrowth of *Lathræa squamaria* from the tree-root it was attached to. Another writer carries the absurd speculation still further. "While these plants," he says, "are apart from those of all other families, and yet have scarcely any resemblance to each other, there remains nothing for it but to put them together in a particular set, as we put into a mad-house lunatics whose manias are completely different, and of whom no one is what he appears or imagines himself to be." Then, after tracing a fanciful resemblance between several parasitical plants and other genera, he adds, "In a word, I consider these Parasites to be specific degenerations of those plants out of whose roots they grow, analogous to the gall-apples and other extraneous growths which are occasioned by the prick of certain insects or even by atmospheric influences."

These attempts to make Parasitism a basis of classification, being altogether false and unscientific, led only to failure and absurdity. Under Dr. Candolle's natural system Parasites fell into their places in the different natural orders. In dealing with them we must remember that we are not studying any one particular class, but only a few genera of different orders which deviate in a remarkable manner in their structure, mode of life, or outward form from the normal type of their near allies.

This deviation is chiefly in the manner in which they take up their nutriment. The ordinary sources of food-supply for a typical phanerogamous plant are the constituents of the soil, which it absorbs according to its wants by means of its roots, and the carbonic acid of the atmosphere, which it decomposes under the influence of light by means of the cells of the leaves containing chlorophyll, the carbon being absorbed and the oxygen set free.

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Parasites are characterised by the fact that they derive either the whole or part of their food from living bodies of other plants by means of organs specially adapted for this purpose.

This definition will exclude another set of plants which very much resemble Parasites but are distinguished by deriving their food from the materials of dead plants, not yet resolved into the inorganic elements of the soil. These are distinguished as Saprophytes, Koprophytes, or Humus-dwellers.

The parasitic Phanerogams which occur, or have been recorded, in Leicestershire belong to the *Orobancheæ* or Broom-rape Order, the *Scrophularineæ* or Figwort Order, the *Convolvulaceæ* or Bindweed Order, and the *Loranthaceæ*, or Mistletoe Order.

The Orobanche (= Vetch-strangler, of which the English Broom-rape = Broom-destroyer, is a rough translation) gives its name to the Order of *Orobancheæ*, grouped by Sachs with the Figwort and Bladder-wort Orders as *Personales*. They are parasitic on the roots of various plants, *e.g.*, Broom, Furze, Thyme, Galium, Picris, Ivy, Clover, Yarrow, &c.

The absence of green leaves containing chlorophyll in these plants, which are at the same time closely allied to others producing broad leaves rich in chlorophyll, is to be explained in this way. They are the transformed descendants of plants that once contained chlorophyll, but having become parasitic and accustomed to take their food direct from other plants, they had no longer occasion to use their own leaves for the purpose of obtaining carbon from the atmosphere. The leaves having thus become useless ceased to perform their natural functions, and either degenerated into small brown rudimentary scales or else became altogether obsolete.

According to this explanation, the Parasitism must have been anterior to the leafless condition of the plant, and the following statement of Prantl seems at first sight to be confusing:—"A number of plants which are not furnished with chlorophyll are unable, in consequence of its absence, to decompose carbonic acid; hence they *are compelled to derive* their organic compounds direct from other plants, or from the decomposing remains of other organisms." This seems to mean that the absence of chlorophyll is the cause of their parasitic habit, and the same apparent confusion occurs in Sachs's own statement:—"It is simply the *want of chlorophyll* which here *makes altogether superfluous* the extension of the surface in the form of large leaves: the body of the plant is therefore developed in short axes, and appears naked and ungraceful." We must, I suppose, interpret these writers to mean that the ancestors of these plants, having hit upon a device for procuring a ready-made supply of the organic compounds necessary for their sustenance, developed habits of idleness, and then no longer requiring the services of their leaves, they dispensed with them as an unnecessary encumbrance. Their descendants henceforth had no option in the matter, and in this sense were compelled to continue the parasitic habits of their forefathers.

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A further examination of the Orobanches discovers other deviation from normal structure, indicative of degradation. The embryo of the seed is destitute of either plumule or cotyledon, and the seeds themselves are unusually minute.

If a growing plant of Orobanche be carefully taken up, its point of attachment to its host-plant (as it is called) is at the swollen base of the stem. But really the union begins at the first germination of the plant. The small embryo (destitute, as we have said, of plumule or cotyledon) sends out a thread-like process. As soon as the end of this meets with the root of a plant available for its purpose, it bores into it to the cortex and penetrates to the woody fibre. On the surface of the root is formed a tubercle or ball-shaped growth of tissue, forming the swollen base of the plant-stem. This often sends out adventitious rootlets, which either attach themselves to other roots of the same host-plant, or, it may be, aid in supplying water or other ingredients to the plant.

The characteristics of the parasitism of Orobanche are that it is parasitic from its birth, the stem is attached immediately upon the root, and the union is thus so intimate that it is impossible to distinguish where the vessels of the Orobanche end or those of the host-plant begin. Of the six British species of Orobanche, three have been found in Leicestershire: *major*, *Hederæ*, and *cærulea*.

Several genera of the Figwort Order are said to be parasitic on roots of other plants. Of these there are found in our County *Bartsia Odontites*, *Euphrasia officinalis*, *Rhinanthus minor*, *Pedicularis palustris*, *P. sylvatica*, *Melampyrum pratense*, and *Lathræa squamaria*. The last of these is the only one which presents any external indication of irregular growth. It is leafless, whitish, with bluish flowers, and quite destitute of chlorophyll, in this respect resembling the Orobanches, with which it was formerly grouped. It is parasitic on roots, chiefly of hazel. The others all manufacture their own carbon by means of leaves, with which they are well provided. The attachment of these parasites to their host is by means of haustoria (as they are called), which grow from the root. They are described as being lateral swellings of the root, which fit themselves upon the root of the host like a saddle. The vascular bundles of the root of the parasite develop a tissue of elongated cells, which first penetrate through its own epidermis and then through the epidermis and cortical layers of the root it preys on.

The Dodders belong to the *Cuscuteæ*, by some reckoned of the Bindweed or Convolvulus Order, by others grouped into a separate Order. Their habit is peculiar. They are annuals, the seed of which often gets mixed with and sown at the same time as the host. As soon as the seed begins to germinate, it sends upwards filiform stems. When this meets with a stem of some favourite plant, such as Flax, Clover, Thyme, Furze, it fastens upon it and develops a sucker, or haustorium. It then relinquishes its connection with the earth, sends out its twining stems, developing fresh haustoria at intervals, and completely smothers its host. The Dodders have no leaves. At intervals on this threadlike stem they

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produce ball-like heads of flowers, pink, yellow, or white, with a whitish calyx, with scales below the stamens. In this case the Dodder plant, having no connection with the earth, must derive all its nutriment direct from the host-plant. Hence again the absence of chlorophyll. Leaves for the manufacture of carbon are unnecessary. It has discarded them altogether.

The haustorium of the Dodder is formed by minute papillæ or swellings of the epidermis of the Dodder, which lay themselves closely upon the stem of the host. Within this, the vascular bundles of the stem grow out, at right angles to their stem, in a bundle of rows of elongated cells, which, growing forward at the end, break first through the cortex of Dodder and then that of the host-shoot to penetrate to the woody fibre of host-plant, and sometimes to its pith.

Sachs regards these haustoria as reduced, or modified, forms of roots. The species occurring in Leicestershire are *Europæa* and *Epithymum*.

The Mistletoe is excluded from the Leicestershire Flora, as there is no authority for its being native to this County. It is known to have been planted in several localities, where it is still flourishing. Strictly speaking, therefore, it is beyond the scope of this Paper, but as it presents some remarkable points of contrast with other parasites, a few words may be allowed. Its association with Druidical ceremonies in the almost mythical period of our forefathers, and with other modern festivities more social than religious, has gathered round it a store of folklore more interesting perhaps than the dry details of its growth and structure. Yet these are curious enough. Parasitic as it is, without any direct connection with mother earth, it is yet, by its wealth of chlorophyll, able to provide for itself its chief nutriment from the atmosphere, and is only dependent on its host perhaps for water and some mineral ingredients.

When the one-seeded berry of the Mistletoe has become attached by its viscid pericarp to the young branch of a tree, the embryo begins to germinate. The radicle turns toward the tree to which the seed is attached, and bores through the outer layers of the stem as far as the wood. It is probable that where this main root appears to have penetrated the wood, it is the annual additions to the wood which have enveloped the root of the parasite. Later on, from the base of the Mistletoe stem, runners grow inside the sappy cortex, parallel to the axis of the tree, to a considerable distance. Out of these, at intervals, grow smaller roots (or suckers) towards the central wood. There are thus three forms of root: the main original one, the cortex root, and the sucker. All these deviate more or less from the type of a genuine root. The cortex roots have a root-cap, but only imperfectly developed; the sucker roots become surrounded with permanent tissue at what is called the growing point, and whatever growth goes on is in the part that lies in the cambium tissue of the tree stem. Further out of the cortex runners, adventitious shoots develop, which break through the bark of the tree and form other bushes. Sometimes this process is continued until a tree is completely infested with them.

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As to the kind of tree on which it grows, it seems to exercise a certain selection, but yet the list would be a long one. Dr. Bull gives as many as 30 species of tree on which it flourishes in England. In Germany, Solms says that it is parasitic on more than 50 different kinds, and notes that it seems in certain localities to prefer one species, in others another; also that it grows to a larger size on some species than on others, and to be the largest on the Black Poplar, and the least on some species of Pine.

To sum up our results, it appears that these parasitic Phanerogams are of rare occurrence in the County. Those that are recorded give us examples of both under-ground Parasitism and of above-ground or aerial Parasitism: the Orobanche, Broom-rape, and Rattle-tribe of the former, the Dodder (and Mistletoe) of the latter. Again, the Orobanche is attached directly from the stem on the root, the Rhinanthus tribe by root-haustoria on the root, the Dodder by stem-haustoria on the stem, the Mistletoe by forms of root on the stem. The tendency of Parasitism is to degrade the plant that is parasitic to a leafless condition. Mistletoe is the remarkable exception to this, of which no satisfactory explanation has yet been discovered.

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SOME NOTES UPON THE HABITS AND VOICES OF OUR BRITISH SONG BIRDS, WITH SPECIAL REFERENCE TO THOSE FOUND IN LEICESTERSHIRE.

By G. H. STORER. (Read before Section "E.")

I HAVE perused with much pleasure the interesting paper on "The Songs of some Leicestershire Birds," read by Mr. Mott before Section "D," and published in the New Quarterly Series of the Transactions for January of the present year, and thinking that some of my own notes upon the habits and voices of our little songsters might prove not quite devoid of interest to the Members of this Section, I have collected them together and present them for your kind attention this evening. It is, I must confess, with considerable reluctance that I do so, for I am well aware that we have amongst us gentlemen, whose greater experience and observations extended through a longer period of time than mine could possibly have been, would enable them to treat the subject with far more justice than I can hope to do. I am, however, encouraged to proceed from the knowledge that the paper will meet with that kind consideration which my previous efforts have always received.

By common consent the Nightingale has always been considered the chief of our song-birds; and its glorious voice has a rich fullness which is totally unlike that of any other bird. In our own County it seems to me to confine itself to certain favoured spots, to which it returns regularly year after year. Braunstone Spinney is every season visited by it, also a coppice on the Hinckley Road near a bye-path leading to Kirby Muxloe, and also Glen Magna. The nearest locality to the town that I am aware of, is a copse at Stoneygate, near Mr. Toller's house, where I have heard it several times. This bird sings best during the first fortnight or so after its arrival, whilst it is seeking its mate, when the nest is built and the eggs laid less continuously, and after it has young almost entirely ceases. The latest date that I have heard its voice was on Jubilee Day, June 21, 1887, at the Canal side, Wistow Park. Mr. How and myself had been fishing during the morning, and were now, at noon, resting beneath the bridge, watching lazily the troops of dragon-flies hawking for prey above the surface of the water, when the notes of Philomel rang out from a tree directly opposite us—jug! jug! jug—aree!!—a sudden stop—a croak—and all was over, for the effort seemed quite too much for him. Although we waited patiently hoping that he would recommence, we were disappointed, for we heard him never again. Some friends of mine

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found a nest of the Nightingale in a spinney near the Hinckley Road. It was built in a bush—I believe a briar—almost upon the ground—and was very untidily constructed of bents and brown oak-leaves. It contained five eggs.

A bird with a voice almost as rich as the Nightingale's, and quite unique in its way, is the Blackcap. He is a shy, restless bird passing quickly from branch to branch in a hedge-row and usually contriving to keep one or more of the stoutest between the observer and himself, for he hates to be noticed, yet when he sits with throat widely distended, carolling his wild, sweet, and powerful song, he may be approached more easily and permits a nearer view. This species seems to prefer the edges of woods. At Swithland it is fairly common during the summer, and I have also seen it near Braunstone. Last June, Mr. How and myself found two couples near Swithland Wood. As one pair seemed to haunt a particular spot, I determined to watch them, and soon saw the female engaged in nest-building in a small bush growing from the bank of a brook on the skirts of the Wood. A slight foundation of hay had been laid, but I am sorry to say the nest was never completed for a day or two afterwards I found that it had been deserted.

The Garden Warbler is also a very sweet singer; it is as active, but not so shy as the Blackcap, commonly frequenting gardens and shrubberies. I have seen it dart upon passing insects and seize them with its bill, exactly in the same way as the Spotted Flycatcher.

The voice of the Whitethroat consists of various harsh, jarring notes delivered with erect body and inflated crest in a very pugnacious style. In the early summer it often appears transported with bursts of rapture, when it springs from its perch and rises and falls in the air with quaint quivering motions of the wings.

Far less common with us is the Lesser Whitethroat, with whose nest and eggs I am more familiar than with the bird itself. The nest is a little cup-shaped structure of hay like the Whitethroat's but even less compactly built, for it is often easy enough to see through the bottom, and the eggs, four or five in number, are white with a creamy cast, spotted mostly at the larger end with ash colour, grey and dark brown. They do not seem to vary much in size, those which I have measured being $\frac{9}{16}$ or $\frac{10}{16}$ inch long by $\frac{7}{16}$ inch broad. Specimens from Ansty are exhibited.

The Wood Warbler, Willow Warbler and Chiffchaff are all found around Leicester,—the Chiffchaff, I think, much the most commonly. The songs of the Wood Wren and Chiffchaff are mere repetitions of the syllables chee-chee and chiff-chaff respectively; that of the Willow Warbler is much more varied, consisting of many modulations of the voice which rise and sink in sweet cadence as the bird sits with drooping wings and elevated crest on some prominent twig. This bird is by no means shy. One specimen which was brought for my inspection by Mr. How, who had obtained it from a bird-catcher, escaped from him during the examination and flitted lightly around the office, hawking for flies, without exhibiting the least fear at our presence, and was finally retaken as it sat perched

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upon a ledge near the window,—it attempting no resistance. This bird had been trapped the day previous, and would no doubt have made a very interesting addition to Mr. How's aviary, but the next morning it had departed, having contrived to escape through a wire mesh too small for the Lesser Redpole.

The Wood Wren I have only met with a few times in the county, the last date was August 25, 1888, at New Evington, although Mr. Mott thinks it "common every summer among the plantations and wooded hedgerows on the northern side of Leicester." However, I trust to make further acquaintance with it in the near future.

The tiny Gold-crest, which is far more common than is generally supposed and approaches quite close to the Boro'—I have specimens from Ansty Gorse and New Humberstone—possesses a soft, gentle, twittering voice, frequently uttered as it hangs half suspended from the fir branches after the manner of the Titmice, or darts with fiery activity from twig to twig, busily looking for prey, or hovers for an instant above the favoured bough beneath which its tiny nest is slung.

The Reed Warbler and the Sedge Warbler are most assiduous singers, carolling their curious songs at all hours of the day and night; in fact it is only necessary to throw a stone into the haunts of either of these little birds to set it singing with might and main any time during the twenty-four hours. I have heard the Sedge Warbler singing at midnight. Its song is a hurried, babbling chatter, delivered from the summit of a willow-bush or clump of reeds, and at times the bird rises into the air on quivering pinions and poises itself an instant to sink again upon the same perch with tail out-spread and upraised wings. The Reed Bird's notes are harsher and not particularly musical, and the amusing way in which it is uttered somewhat reminds the observer of the Starling's favourite style as he sits with puffed out throat, and drooping wings chanting his canticle from some cottage roof. Mr. Mott in his paper appears to confound the Reed Warbler with the Reed Bunting or Reed Sparrow,—a very different bird and which has nothing in common with it except its partiality for marshy situations—when he says, "The Reed Warbler or Reed Sparrow is said to be a good songster, but of him—as of the U-tick—I am familiar only with the call note, a perpetual chatter behind the hedges in low-lying meadows. In some counties he is known as the "Chat," from this very characteristic call." The call note of the Reed Bunting resembles that of other Buntings, and its song, though short, is pleasing and by no means similar to the Reed Warbler's. Judging from a specimen which I have had under observation for upwards of twelve months, I should say the Reed Bunting possesses some talent as a mimic. My bird imitates the sparrows, with whom he seems to consider himself somehow related, but his voice being less robust produces a softer and more musical "Chee-ep." I never see this bird without thinking of certain bogs in Ireland, where it was remarkably abundant and where its coal-black head and throat and white breast made it almost as conspicuous as the clumps of cotton-grass which waved their lovely tufts of down above the waste.

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As regards the other Buntings, the voice of the Yellow-ammer is familiar to everyone, and its curious notes are variously interpreted in different parts of the country; that of the Corn Bunting is almost precisely the same, but there is no reference to "cheese" at the end. A Yellow-ammer in my possession had a curious habit of springing an inch or two higher than the perch upon which he intended to settle, and then dropping down upon it. As the bird had been "twigged" by a bird-catcher it is possible that the cautious creature examined the perch previous to alighting, fearing to be limed a second time. This habit was continued for several weeks until he became familiar with the aviary and forgot his suspicions, but even now, although I have had him thirteen months, he is still the shyest of my little captives. In a state of nature the Yellow-ammer betrays small fear of Man and sings his little song from the top of the hedge although he may be but a few yards distant.

Of the Finches the most gifted musicians are the Gold-finch and Linnet. The Gold-finch's song is loud and powerful, but sweet, and is continued almost throughout the year. I have not found him so plentiful in our own county as I should have liked. I have seen a few specimens now and then about Ansty Gorse and the Dane Hills—but not in any great numbers. On August 2nd, of this year, we disturbed about a dozen feeding among thistles in a field at John Ball's Fox Cover. A bird-catcher tells me that he gets most of his from Northamptonshire. In Co. Cavan, Ireland, this bird seems to be abundant, and builds in most of the gardens and orchards. The Chaffinch is a sprightly singer, although his song is neither very long nor very varied. During the pairing season he is very combative, and fierce fights take place amongst the males. The bird-catchers, taking advantage of this, capture the Chaffinch by a process known to them as "pegging." They employ a tame caged bird as a decoy, and secrete its cage in a hedge upon which they have affixed many limed twigs and a stuffed bird, mounted upon a little stick or "peg," prominently displayed. Directly the decoy begins to sing, the male Chaffinches in the vicinity rush down to give battle to the rival, and falling upon the stuffed bird are held by the limed twigs. A few years ago when the Chaffinch mania was raging in London, I was told by a very intelligent catcher that he frequently met Londoners so far north as Lincolnshire engaged in pegging, and that during the season he had sent many dozen birds to dealers in the City. A "pegged" bird was always considered much more valuable than one brought up from the nest or taken in a net, and in the contests would strive with all the passionate energy of the wild bird to out-do all rivals. In these contests the birds are placed each in its cage upon a table, and the one which trills its little song the most times within a specified period—usually an hour—wins the prize. The different notes of the Chaffinch's song must be properly intoned by the competitors, and special men, adepts in the work, are told off to mark down the singing of each bird. Goldfinches and Linnets are also sung in a similar manner. The call note of the Chaffinch strongly resembles the syllables "Pink" or "Twink," whence the popular names of the bird are derived. There is

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another trait of character in the Chaffinch which I must mention. He is brave. He can be also merciful, as I hope to prove. In my aviary I have a pair of Chaffinches. One summer morning I picked up a young Sparrow which had fallen from the nest, and though fairly feathered was unable to fly; I placed it in a cage in which were about a dozen other birds, including the Chaffinches. No notice was taken of the little stranger for a time—except by the Reed Bunting, who tried in a half-hearted sort of way to play the bully by opening his beak and making a dead set at the intruder,—until the Sparrow began to cry out for food, when to my great joy I perceived the hen Chaffinch approach the seed-box and taking a few seeds in her bill begin to feed the youngster. After a while the male bird joined her, and the two together attended to the wants of the stranger until it was able to look after itself. The behaviour of the male bird was most amusing. He disdained to feed the Sparrow directly himself, but was not adverse to doing it by proxy. So he carried his seeds to the hen and she placed them in the mouth of their mutual protégé. I have the three of them still, and trust they may live long to cheer me with their lively motions and to prove that Good Samaritans are not confined to men. The monotonous song of the Greenfinch, or Green Linnet, as he is more generally called around Leicester, is well described by Mr. Mott as "being simply a long 'Chirr-rr-rr' on one note, repeated at distant intervals in a lazy manner."

The tiny Lesser Redpole is not much of a singer. His voice is a soft chattering delivered in a very self-satisfied sort of way with body erect, but so low that one must be near enough to see the motions of his bill before it is possible to hear his notes. He is very active, climbing about the twigs of a tree-branch very much like the Titmice, Siskins and some other little birds, and I once shot one running up a stone wall precisely as a Tree-Creeper might have done. In captivity on the approach of Summer the dark forehead of this bird changes to crimson, and his creamy-white breast becomes suffused with delicate rosy tints just as they would have done were the bird free and in the fields, but his relative the Linnet retains his sombre brown coat throughout the year, refusing to wear in prison the rich red and glowing carmine which he dons for the courting season when wild amongst his native gorse. The captive Linnet seems to wear mourning for the freedom he has lost, and like the blinded Chaffinch in the streets of Paris, sings to dispel the sadness of his heart with visions of the fresh and breezy heaths he can never visit more.

Everybody is familiar with the song of the Skylark, and I shall not here attempt to describe it. Why I mentioned its name at all, is to direct attention to a fact long denied by certain naturalists, and that is its ability to perch in trees. The Rev. J. G. Wood goes so far as to say that the formation of its feet quite incapacitate it from grasping the branches. With this opinion I cannot at all agree, as I have repeatedly seen it perched whilst in captivity, and those who attempt to introduce a Lark in a limited space in which are other small birds, will find that it has a habit of reaching the topmost perch, and by perpetually attempting to soar still higher, causes

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much commotion and sometimes danger to its fellow-prisoners. A friend, in whose word I place the greatest confidence, tells me that during severe winters he has often noticed the Larks in Ireland roosting in trees, from which they descend in flocks upon the snow-covered ground. Larks are much harassed by certain hawks, particularly the Hobby and the Kestrel, and at such times are frequently so terrified as to seek the protection of Man. One such instance came under my own notice. I was in company of three friends snipe-shooting in December, 1882, at Arnesby, and in the afternoon we were entering a shed when we perceived a Lark flying towards us hotly pursued by a Kestrel. The Lark entered the barn and dropped, trembling with fright, in the straw at the feet of one of my friends, just as its swift pursuer reached the door. Directly it saw us, the Kestrel veered off at a right-angle, and a few seconds after its departure the Lark recovered itself and left also.

The Meadow Pipit is also credited with roosting almost entirely upon the ground, but strange to say, the first bird of this species which I ever shot was perched upon a fence, and since then I have seen several in trees and once shot one with the idea that the bird was the rarer Tree Pipit. The Meadow Pipit sings whilst soaring like the Sky-lark but never attains to the same altitude in the air. Its voice is soft and sweet and is not continued for any length of time. The Tree Pipit has a much more powerful and varied song—many of his notes being very loud and clear—and he delights to soar from the summit of some tall tree such as an ash or an elm, and after hovering awhile in the air descends to the same branch and there finishes his song.

There is one other bird about which I would like to say a few words, and that is the Starling. The Starling is not usually considered much of a vocalist, and I must confess that until recently I did not think very highly of his musical powers myself. His song consists of a collection of harsh, distinct sounds, sometimes loud and shrill, and sometimes soft and gurgling, like the babbling of a brook; but in my opinion his grotesque manner of delivery amply compensates one for any lack of melody. Very often, particularly during the courting season, he accompanies his efforts with much flapping and shuffling of the wings, which combined with his expanded throat, give him a truly comical appearance. The Starling is heard at its best when singing in company, and strange as it may seem, although the voice of each individual alone is hardly worth attention, the effect of the whole band is exceedingly pleasing and quite unique amongst our native birds. It is during the Fall and Winter that these performances are heard at their best, more especially in the evening when the flocks assemble amongst the willows to couch for the night. The grandest bird-concert that it was ever my good fortune to hear, occurred about the middle of January, 1887. Mr. How and myself were walking in some fields near Blaby, which abutted upon a coppice with a thick undergrowth of briars and rushes. It was about four o'clock in the afternoon when we noticed a magnificent elm-tree at the far end of the copse, whose branches were most thickly

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covered with a multitude of Starlings all energetically whistling. We had not watched them above a minute or two before a large detachment separated themselves from their fellows in the tree, and acting as though under the command of an officer, swept over the fields like a skirmishing party, and after making a wide detour, returned. The song of their companions had been hushed as they left the tree, but now they pealed forth their loudest notes, and joined by the others, produced a sound one might almost call sublime. Every few minutes fresh bands left and returned to the tree, the music of their voices falling and rising regularly, until tempted by a desire to get nearer to the musicians, we attracted the notice of the vigilant sentinels on the lower branches, for with a scream they flew off, and soon the whole flock—to the number of two or three thousand we should think—was in motion, the rushing of their wings through the air sounding loud as the roar of an angry river in its rocky bed. As a mimic the Starling is, in my opinion, equalled by no other British bird, and on that account alone makes a most amusing pet. A friend of mine possessed one which, although untrained, imitated the crowing of the farmyard cock to such perfection that he frequently set all the roosters around crowing in defiance. He seemed to obtain much satisfaction from this trick.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

There have been two meetings of this Section held, with an average attendance of 10 members.

The names of Mr. G. B. FRANKLIN and Mr. A. P. MOORE, M.A., have been added to the list of Members of the Section.

October 16.—The CHAIRMAN opened the Session by reading a Paper on "The Beaumonts of Gracedieu."

November 20.—Mr. WM. JACKSON read a Paper on "*Sartor Resartus.*"

A. H. PAGET, *Chairman.*

"SECTION D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

September 19.—The SECRETARY reported that the Field-day, on the 12th, was attended by eight Members, who went over the fields to Great Stretton, a small village on the old Roman *via Devana*, now called Gartree Road.

Exhibits.—By Miss GRUNDY, Miss NOBLE, and Mr. KNOWLES, Seedvessels of the *Umbelliferæ*, *Cruciferæ*, *Labiatæ*, *Sapindaceæ*, *Cupuliferæ*, and other orders.

By Rev. T. A. PRESTON, three trays containing about one hundred fresh seedvessels, with sections, all carefully named and admirably displayed. Also fine examples of the pod of the Brazil-nut, and the huge Monkey-pot containing the Sapucaya-nuts.

Mr. HEADLEY exhibited a fine specimen of the Oak Beauty Moth (*Amphydasis prodromaria*) captured last March near the Victoria Park, and not previously recorded in the County.

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The CHAIRMAN stated that he had measured the growth of a plant of *Antirrhinum majus*, with the apparatus exhibited at the last meeting, from August 13th, when it was 11½ inches high, to September 19th, when it was 26 inches, and found that its rate of growth, which was at first ⅛ of an inch per day, gradually increased to ½-inch; the most rapid growth being that of the flower-spike, after emerging from the upper leaves. Something might be due to difference of weather, September having been a little more genial than August, but he believed that there was a natural tendency to the rapid elongation of the flower-spike.

Paper by Mr. THOS. CARTER, LL.B., on "The Parasitic Phanerogams of Leicestershire," including the genera *Lathræa*, *Orobanche*, *Cuscuta*, and *Viscum*, as undoubted parasites, and those of *Rhinanthus*, *Bartsia*, *Euphrasia*, *Pedicularis*, and *Melampyrum* as somewhat doubtful.

A lively discussion followed, during which the Rev. T. A. PRESTON stated that he had once taken the trouble to trace the root of an *Orobanche*, which gradually diminished to a very slender thread, and at the distance of about six feet horizontally he found it attached to a rootlet of *Centauria scabiosa*. The *Orobanche* had other roots which descended into the soil.

October 17.—An unusually small meeting, chiefly occupied with a discussion upon the differences between "Amphibians and Reptiles."

November 21.—Paper on "The Amphibians and Reptiles of Leicestershire," by the CHAIRMAN.

The County record included only four Amphibians: the Frog, the Toad, and two species of Newt; and five Reptiles: the Viper, the common Snake, the Blindworm, and two species of Lizard. Of the nine existing Orders, four were represented in this list, but it contained a very small proportion of the known species, which amount to more than 2000.

A discussion ensued respecting the variations of colour observable among frogs. Mr. E. F. COOPER said there was some evidence that frogs became darker under the influence of fear. Mr. PALMER believed he had seen this take place. Mr. VICE had observed that frogs appeared darker in the water than on land. The CHAIRMAN remarked that a power of changing colour was known to exist among certain reptiles, and was most noticeable in the chameleon.

Gift to the Section.—The CHAIRMAN read a letter from Mr. F. BATES accompanying a very handsome gift of 100 microscopic slides of British Diatoms from Norfolk, all named and arranged in four cases. They were presented to the Leicester Literary and Philosophical Society for the special use of Section "D."

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It was moved by Mr. E. F. COOPER, seconded by Dr. COOPER, and carried with acclamation, "That the Members of Section "D" present their cordial thanks to Mr. Bates for his very handsome and valuable gift, and are much gratified to learn that he will remain a Member of the Section."

The CHAIRMAN pointed out the great need for better accommodation for the Sections of the Society. They had at present no place in which they could keep such donations as this, nor any lock-up cupboard for microscopes, nor even a shelf for their books.

Exhibition of Ferns.—By Dr. COOPER, fresh fronds of greenhouse ferns, about 20 species.

By Mr. E. F. COOPER, a large collection of dried specimens of British and foreign species.

By Mr. VICE, Mr. THORPE, and the CHAIRMAN, interesting collections of dried specimens.

By Mr. TURNER, a collection of very large fronds of foreign species, mounted on sheets of elephant-folio size.

Much information was gained by the comparison of these collections, and many unnamed specimens were identified.

Other Exhibits.—By Mr. GRUNDY, a living example of the curious mollusk, rare in Britain, *Testacella mangei*, a slug with a shell on its tail, which lives underground and devours earthworms. This specimen was found near Bristol.

By the CHAIRMAN, a large specimen of the Dry-rot fungus, *Merulius lacrymans*, showing the thick solid cords, a quarter of an inch diameter, by which it sometimes creeps along cracks and crannies; the rust-coloured folds of the hymenium on which the spores are borne, and the curious conical excresences which hang from the mature hymenium.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

September 24.—Messrs. W. H. LLOYD and GEORGE WARD were elected Associates of the Section, on the proposition of the SECRETARY, seconded by Mr. MONTAGU BROWNE.

The last-named gentleman then read a Paper entitled "Evidences of the Antiquity of Man in Leicestershire" (printed at pp. 7-37, Part IX., of the "Transactions").

An animated discussion followed, in which the Chairman of the evening (Mr. C. J. BOND), Mr. J. D. PAUL, and others, took part, and a vote of thanks was unanimously accorded to Mr. BROWNE for his Paper.

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Objects Exhibited.—Specimens of bronze and stone implements and weapons, including some very fine examples of the latter, a tool formed from Deer's horn, and some portions of antlers of Deer, all from the County, by Mr. MONTAGU BROWNE.

Various *Lepidoptera*, by Mr. B. HEADLY.

Physiological and Pathological Micro Slides (including specimens of developing bone in femur of Kitten, and typical slides of *Scirrhous Cancer* and *Epithelioma*), by the SECRETARY.

October 15th.—The CHAIRMAN read a most able and interesting Paper upon "Animal Heat."

He commenced by arguing that the attention of Members of the Section should not merely be confined to Zoology in its classificatory and allied aspects, but that attention should also be given to questions involving Comparative Anatomy and Physiology. He had therefore fixed upon the subject of Animal Heat, not solely because of the interesting nature of the subject itself, but also in the hope of interesting some of the Members with a view to work in the direction of possibly elucidating further facts in relation to it.

After alluding to the fact that the explanation of Animal Heat touches some of the most intricate points in the science of Physiology, he went on to show that all animals are not alike in their temperature, but that we find both warm and cold-blooded animals, the difference between the two being that warm-blooded animals have a constant temperature, while that of cold-blooded ones varies with the temperature of the medium they inhabit. It was impossible to draw a direct line showing an increase of temperature from the lowest to the highest forms, as the lines of development in this respect branch out in various directions. As an instance, it was shown that some Insects have a higher temperature than Fishes, although, of course, occupying a lower position in the scale of life.

As a whole, the higher genera and species would be found to possess the highest and most constant temperatures, that of Mammals generally (with the exception of the *Chiroptera*) being about 100° Fah., and the range of temperature between those species having the highest and those having the lowest about 5°. Birds would be found to have a greater range—from 100° to 111° Fah.; and in the case of the lower orders, as *Reptilia* and *Amphibia*, attention was called to the fact that their temperatures vary very largely, the Frog being able to live when its body temperature is only 33° Fah.

Hybernation, and its effect in reducing the vital actions, was next touched upon, and it was shown that the heat of the bodies of hybernating animals is considerably reduced—*e.g.*, the Dormouse becomes much colder during the hybernating period. Some interesting observations by Darwin anent this portion of the subject were also given.

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Regarding the means by which the heat of the animal body is produced, it was shown that the metabolism of protoplasm is manifested in two ways—either by heat or work, and that, in the case of a contracting muscle, the proportion of the former to the latter would be as 5 to 1. It was also demonstrated that nerve action is productive of heat. The importance of the vaso-motor system in regulating the heat of the body by increasing or diminishing the calibre of the blood-vessels was mentioned, as also the fact of cold decreasing (in cold-blooded animals) metabolism in the body, though the reverse condition obtained in warm-blooded animals.

Amongst other points touched upon were the various arrangements for preventing dispersion of heat from the body in warm-blooded animals, as the hair in most Mammals, blubber in the case of the *Cetacea*, feathers in Birds, &c. In the case of some hairy Mammals also, the coat was shown to vary in thickness according to the seasonal temperature. Speaking of the Arctic forms of life, and also of those found inhabiting hot springs, Dr. Pope showed how, in each case, the various species had been gradually educated to bear extremes of heat or cold, mentioning the fact that snails have been found existing in water at a temperature of 100° Fah.

In speaking of the question of development, it was demonstrated how, in the case of the Chick, the embryo passes through successive stages answering to the Fish and Reptile, before finally attaining its true position, and how the heat follows these changes, the embryo being at first practically cold-blooded, requiring the assistance of the parent for the maintenance of a suitable temperature.

In further illustration of this point, it was shown how the eggs of Fishes, after being deposited, were left to hatch in a medium of low temperature. In the case of Reptiles, the eggs were usually laid in a place where some amount of heat is evolved, as dung-heaps, &c.; but in the order Mammalia, with one or two exceptions, the embryo passes through all its most important developmental changes in the body of the mother, where the heat is considerable, and where also the nutritive material supplied to it is of a corresponding temperature.

In addition to the above, many other points were brought forward and explained, the Paper throughout being a valuable *resumé* of the present state of knowledge on the subject.

In the discussion which followed, Mr. C. J. Bond was of opinion that the fact of an animal being warm-blooded could not be looked upon as an unmixed advantage, as it rendered individuals liable to the attacks of parasitic diseases, and mentioned Anthrax, or splenic fever, as an instance in which the disease germs require a high temperature for their propagation, showing also that it is possible to communicate the disease to cold-blooded animals, provided that their temperature be raised to a sufficient elevation.

Mr. W. A. Vice, in speaking of hybernation, thought that, in the case of Birds, migration would obviate any necessity for that state in connection with them.

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After some further remarks from Mr. MONTAGU BROWNE, a hearty vote of thanks was unanimously accorded to the CHAIRMAN for his Paper, on the proposition of Mr. W. A. VICE, seconded by Mr. MONTAGU BROWNE.

Dr. POPE, in replying, expressed himself unable to agree with Mr. BOND in his remarks respecting parasitic diseases, and went on to show how numbers of parasites were found infesting cold-blooded animals, and also plants, expressing an opinion that in such cases as the one mentioned by Mr. BOND, it was probable that the micro organisms had acquired the power of living in a high temperature, like the snails in the hot ponds.

Objects exhibited.—Specimens of Blindworms (*Anguis fragilis*) living, and also spirit preparations, from the County, by Mr. G. H. STORER.

Collection of Shells of British and American species of the Fresh-water genera, *Sphærium* and *Pisidium*, by Mr. H. E. QUILTER.

Various *Lepidoptera* from the County, including *Sesia cynipiformis*, *Bombyx neustria*, *Eubolia cervinaria*, *Hydræcia micacea*, *Hadena contigua*, *Cosmia affinis*, &c., by Messrs. BOUSKILL and HEADLY.

November 12.—Messrs. O. T. ELLIOTT and F. BOUSKILL were elected Associates of the Section, on the proposition of the SECRETARY, seconded by Mr. MONTAGU BROWNE.

Mr. G. H. STORER then contributed a Paper, full of interesting observations, entitled "Some Notes upon the Habits and Voices of our British Song Birds, with special reference to those found in Leicestershire" (printed at pp. 21-27).

Mr. MONTAGU BROWNE proposed a hearty vote of thanks to Mr. STORER, which was seconded by the CHAIRMAN and carried unanimously.

Mr. MONTAGU BROWNE then read a list, with notes, of the *Amphibia* and *Reptilia*, both recent and fossil, which have been found in the County. The list, which was a very full one, brought up to date, will appear in his new work on the "Vertebrate Animals of Leicestershire and Rutland," now in the Press. He also brought forward a short communication upon the occurrence of the Black Tern in the County, and exhibited a fine series of local specimens, viz.: one adult male, a female, almost similar, and in the black dress of Spring, together with a young specimen in the patched plumage of immaturity, all taken at various times in the Abbey Meadow; and, in addition to these, an adult specimen in change to Winter dress, from Aylestone.

Other objects exhibited were:—An extensive series of skins of local birds, including Brambling Finch, Hawfinch, and Tree Pipit, as also a number of eggs of Nightingale, Garden Warbler, Lesser Whitethroat, Golden-crested Wren, Tree Pipit, and other birds, from the County, by Messrs. G. H. STORER and F. F. HOW.

F. M POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1889.

Jan. 21.—M. L. LEWIS, Esq., M.A., LL.M. "Robinson Crusoe."

Feb. 4.—Professor HENRY MORLEY. "The Right Reading of Books."

Feb. 18.—H. J. MACKINDER, Esq. (Reader in Geography in the University of Oxford). "Geography *and* Geography."

Mar. 4.—Captain W. DE W. ABNEY, C.B., F.R.S. "Colour Measures." (Illustrated with Experiments.)

Mar. 18.—G. H. NELSON, Esq., M.A. "John Ziska."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. A. H. PAGET, West Walk.

Secretary—Mr. JOHN SCAMPTON, 1, Pelham Street.

The Meetings will be held in the Council Room, Town Museum, on the third Monday in each month.

1889.

Jan. 15.—Mr. A. P. MOORE, M.A. "Characters and Character Drawing."

Feb. 19.—Mr. C. J. BILLSON, M.A. "Robert Louis Stevenson."

Mar. 19.—Mr. G. B. FRANKLIN.

A. H. PAGET, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, St. Stephen's Road, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

1889.

Jan. 16.—This evening will be devoted to the microscopic examination of the large collection of slides of Diatoms, Sections, &c., presented by Mr. F. BATES. Members having microscopes are requested to bring them.

Feb. 20.—Paper on "The Ferns of Leicestershire," by the CHAIRMAN.

Exhibition of early flowers and foliage.

Mar. 20.—Paper on

Exhibition of Eggs of various Insects, to be examined microscopically.

Discussion on the causes of the varied colours of skin and hair in different races of Mankind.

There will be opportunity on each Evening for the introduction of any additional subject which any Member may desire to bring forward.

F. T. MOTT, *Chairman.*

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SECTION "E."

Chairman—F. M. POPE, M.D., Campbell Street.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1889.

Jan. 14.—Paper by the SECRETARY on "The Life-histories of some Animal Parasites." (Illustrated by Specimens and Diagrams.)

Feb. 11.—Paper by Mr. W. P. PYCRAFT. "Notes on the recent Immigration of Sand Grouse." (Illustrated by Specimens, &c.)

Mar. 11.—Papers, by Mr. H. E. QUILTER, M.C.S., on "The Shell and Periostracum of the Mollusca"; and by Mr. GEO. WARD, on "The Chemical Composition of the Molluscous Shell."

The Paper for the Evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

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LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

PART XI., APRIL, 1889.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1888-89.

President:

REV. A. P. DAWSON, M.A.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
A. H. PAGET.
GEORGE STEVENSON.

Council:

Retiring June, 1889.	Retiring June, 1890.
H. BILLSON.	R. HARVEY, LL.B.
E. F. COOPER, F.L.S.	C. W. COOPER, M.B.
T. CARTER, LL.B.	W. KELLY, F.S.A., F.R.H.S.
J. E. M. FINCH, M.D.	T. C. LEE.
G. B. FRANKLIN.	J. H. GARNAR *(Resigned).*
J. M. GIMSON.	E. CLEPHAN.
W. JACKSON.	W. KEMPSON.
C. A. MOORE, M.D.	F. M. POPE, M.B.
J. D. PAUL, F.G.S.	J. J. W. KNOWLES,
JAMES PLANT, F.G.S.	H. ELLIS,
HENRY TOMKINS, M.D.	REV. T. A. PRESTON, M.A.
W. A. VICE, M.B.	C. F. WIKE.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON, Junr.

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Auditors:

E. CLEPHAN. T. C. LEE.

Four Co-optative Members of the Museum Committee of the Town Council, recommended by the Society.

H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.

Sections:

A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,
Chairman, A. H. PAGET.
Secretary, JNO. SCAMPTON.
1, Pelham Street.

C. GEOLOGY,
Chairman, C. A. MOORE, M.D.
Secretary, LOUIS HODGES,
St. Martin's Schools.

D. BIOLOGY, (BOTANY AND ZOOLOGY).
Chairman, F. T. MOTT, F.R.G.S.
Secretary, J. J. W. KNOWLES,
St. Stephen's Road

E. ZOOLOGY,
Chairman, F. M. POPE, M.B.
Secretary, F. R. ROWLEY.
Town Museum.

Number of Members and Associates, 1887-88.

Subscribing 271, Honorary 22, Associates 25.—Total 318.

General Meetings.

Fortnightly, from October to April on Mondays at 7.30 p.m., in the New Lecture Hall, Museum Buildings.

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Session 1888-9.

DECEMBER, 1888—*MARCH*, 1889.

GENERAL MEETINGS.

December 3rd, 1888.—C. J. Billson, Esq., M.A., on "Matthew Arnold."

The Lecturer remarked that last April the news of the sudden death of Mr. Matthew Arnold sent a chill through the hearts of all who loved him. His loss was indeed a national misfortune. Who was there to fill his place? His life had been outwardly, if not commonplace, at least uneventful. He was born on the 24th December, 1822, and was Dr. Arnold's second child, the eldest being the daughter who married Mr. W. E. Forster. Dr. Arnold was taking private pupils at Laleham at the time of his son's birth, and continued to do so until 1827, when he was appointed to the head-mastership of Rugby School. In the next year the family removed to Rugby, but Matthew was sent back to the school at Laleham, which was carried on by Dr. Arnold's brother-in-law, the Rev. John Buckland. One incident in those early years of Matthew Arnold's life was, perhaps, rather characteristic of the future master of language, although there was nothing unusual about it. But it was specially recorded that on the first return for the holidays he considerably horrified his good father and mother by the extraordinary vigour and copiousness of his slang. The lecturer continued to trace Arnold's career at Winchester and at Rugby, where, in 1840, he won the prize for English verse with a poem on "Alaric at Rome." The prize poem was published the same year, and a few copies of it were still in existence. It was, of course, chiefly interesting because it was the first of its author's publications, and threw some light upon his early intellectual habits. It was written under the spell of "Childe Harold," and was one instance among many of the powerful influence which Byron always exercised upon him. Some of the stanzas were so characteristic of the man that they read more like the rough draft of some later poem than the prize verses of a Rugby boy of 17. The poem was recited on the 12th of June, 1840, and in the following November Arnold won an open scholarship at Balliol. He did not, however, go to Oxford until the autumn of the next year, when Dr. Arnold himself had become bound to his old university by new ties, having accepted the Regius Professorship of Modern History. Matthew Arnold distinguished himself at Oxford by winning the Hertford Scholarship and the Newdigate prize for English verse, the subject being "Oliver Cromwell." He

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was, however, like that other great son of Oxford, John Henry Newman, disappointed in the hope of obtaining a first-class in the final schools—though, unlike Newman, he succeeded in taking a second. In the spring of 1845 he was elected a Fellow of Oriel College, and in 1847 left Oxford and was for some time private secretary to Lord Lansdowne. In 1851 he accepted the post of lay inspector of schools and married; in 1857 was elected to the chair of Poetry at Oxford, and there delivered his famous lectures on translating Homer. At the end of his five years' term he was re-elected, but in 1867 his third election was barred by statute, and he could never be induced to stand again. He had, indeed, many other spheres of activity. The round of his official duties was twice interrupted by foreign service. The annual reports published by the Council on Education included many from his pen, which were easily distinguished from the rest, not only by his peculiar charm of style, but also by his mastery of the subject. The school inspectorship formed the business of his life until he gave it up, about a year before his death, but the leisure of his life was full of that kind of work by which he was best known. Apart from his purely literary work, he plunged into controversies of theology and politics, and every year contributed to the reviews a great number of articles chiefly upon the burning questions of the day. His interest in every phase of life was so keen that it seemed quite natural, when any subject rose to the surface, that one should wait to see what Matthew Arnold would say about it.

Having completed his outline of the life of Arnold by a brief reference to the circumstances of his sudden death last year, Mr. BILLSON said that it was not until four years after his election to the Fellowship at Oriel that Matthew Arnold seriously commenced business as a man of letters. In 1849 appeared the rare little volume with the title "The Strayed Reveller, and other poems, by A.;" in 1852, the yet scarcer volume "Empedocles on Etna, and other poems;" and in 1854, "New Poems, by Matthew Arnold." Those, with the second series of poems published in 1855, the tragedy of Merope published in 1858, and a few other verses contained in Macmillan's three vol. edition of "complete poems," comprised, with one or two recent poems, the whole of Arnold's poetical work, and as it was probably true that the less baggage a poet took to posterity, the better pleased posterity would be, Matthew Arnold, with his modest equipment, ought always to be welcomed. For while his poems were not too many and not too long, they were almost all excellent works of art—like those fragments of Sappho which Meleager preserved in his Anthology because they were, as he said,—

"Few flowers, but each a rose."

It was in his poetical work that Arnold's acute literary conscience became most sensitive. He in many ways departed from the teachings of his protector, "the venerable poet at Rydal," but in none was he happier than in repudiating his master's fatal maxim,—

"Give all thou canst—High Heaven rejects the lore
Of nicely calculated less or more."

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But the poems as well as the prose writings of Matthew Arnold possessed something far more valuable than their exquisitely-finished style. They belonged, he thought, to the best kind of literature. There were two things needful for the production of the best kind of literature. In the first place its writer must live in an age of large conflicting spiritual energies, and in the next place he must live with the life of his time. He (the lecturer) thought that Matthew Arnold's writings possessed a good deal of an indefinable quality which he would compare to ozone. Many of his best essays, and most of his poems, were wonderfully bracing and full of health, and that was because the years of his life were years of great spiritual conflict and because he threw himself heart and soul into the current of his age. It was not without a long inward struggle that he succeeded in doing so. He was fascinated by the Sirens and the Circe of modern culture, who invited the "Strayed Reveller" of the nineteenth century to the life of sentiment, to the isolated existence of the dilettante, and the temptation reached its noblest form in a desire for the life of pure contemplation. It was not without a deep sigh of regret that he finally conquered the monastic impulse. The difficulty which the poet felt was that of reconciling the world and self, of "living with the world's life" and yet remaining one of those—

> "Whose one bond is that all have been
> Unspotted from the world."

and that feeling, so common in all ages, was perhaps specially characteristic of our own. Matthew Arnold was indeed a typical child of his age, uniting in his own nature some of its most contradictory elements. The strain between two types of character formed the main interest of a large number of his poems. They recorded the varying fortunes of the battle and final victory of the higher self, and they had, generally speaking, that air of freshness and vigour which belonged only to the best kind of literature. He was the mouthpiece of a generation which was similarly at war with itself. It was because he so truly represented the battle of the day against the retarding forces of materialism and its shadow, despondency, that he had so much literary ozone. There were two poems, 'The Grand Chartreuse" and "Rugby Chapel," which might be taken to represent the extremes of Arnold's poetry. Most of his poems were pitched in keys ranging from the melancholy of the one up to the triumphant notes of the other. They represented the ebb and flow of the battle, and their average temper was necessarily less victorious. No man felt more deeply the dignity and purpose of life than Arnold. He was no materialist. A man might be but a concourse of atoms, a momentary morsel of dust, but after all he had something in him higher than himself, call it what they would—the conscience, the divinity within him—the something not himself which made for righteousness. The poem called "The Buried Life" was a complaint of the supreme difficulty of being true to that hidden self, and from the poem called "Morality" they learnt more about that "infinitely distant" home of the soul. From that poem and its companion piece, "Self-dependence," they saw

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how that mysterious soul of man was linked in the mind of Arnold with the whole order of Nature. He had inherited that sense of comfort which Wordsworth derived from Nature, from losing himself to find himself in the great stream of existence.

In conclusion, the Lecturer referred to Arnold's fondness for what were rather invidiously termed the "lower animals," remarked that in the elegies upon his brother men he rose, as if in justification of his own maxim that "love is the fountain of charm," to his highest level, and then drew attention at some length to his claims as a critic, submitting that his volume of "Essays in Criticism," which appeared in 1865, did more than all the rest of his writings to establish his critical reputation. Having briefly alluded to his other prose works, he remarked that it was probable that Matthew Arnold would be remembered, like Heine, for his divine plaything, and posterity might lay upon his tomb the wreath of laurel. They to whom his teaching was addressed, and whom he set himself on so many different lines to enlighten and stimulate, might surely lay upon it a sword, the emblem of the brave helper of men. To the service of man Matthew Arnold brought a combination of gifts not unlike that "shining freight" which he attributed to Dean Stanley :—

> "Bright wits and instincts sure,
> And goodness warm, and truth without alloy,
> And temper sweet, and love of all things pure,
> And joy in light, and power to spread the joy."

December 17th, 1888.—Rev. W. H. Dallinger, LL.D., F.R.S., on "Contrasts in Nature: the Infinitely Great and the Infinitely Little." (Illustrated by Transparencies drawn from Nature). (Professional.)

January 7th, 1889.—Rev. J. P. O. Tompkins, B.A., on "Wordsworth as a Teacher."

In his introductory remarks he said while Burns, Scott, and others had their thousands of worshippers, Wordsworth's voice was all but unheard by the general public. Yet he retained his faith in the future that lay before his poetry, and had the calm conviction of a man who had sacrificed his powers and knew for certain that he had something to say which the world would come to know the value of. Wordsworth could wait, and did wait, and the world came round to him; but from the very first he had the happy fortune that among his small band of followers and disciples were the most finely-touched spirits of his time.

Wordsworth lacked humour, but he (the lecturer) only indicated the fact, and would not dwell upon it, because each, as the saying was, had the defect of their qualities, and the wise student, knowing that, went to a great writer, not in a carping, cavilling spirit, but with a resolute desire to learn that in which he excelled. Let them ask Wordsworth what his teaching of religion was, and as to that they found his disciples divided. Some ardent admirers regretted the uncertain sound he gave as to the great Christian verities, but he was far from sharing that regret.

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They would always have plenty to teach dogmas in religion, but from that very fact they would repel all those who had come to think the foundation of their dogmas was not solid. They saw the process going on now among them. Many cultivated, conscientious men were repelled by the certainty with which some taught religious dogmas. Where should men like that, some of them the very salt of the earth, find something like a refuge? If he were ever confident he would confidently affirm that in Wordsworth's poems they might find a shadow from the burning heat and trouble of their own too busy thoughts, because they could come to him with the sense that his view of God, and nature, and human life were not the thesis of foregone conclusion, but the ripe fruit of intense meditation on what were the primal instincts of the human heart, on what were its elemental affections, and what were the duties laid on them by the make of their nature and the constitution of human society.

The lecturer spoke of Wordsworth's penetrating power, and the deep emotion of his lines. The strength of his teaching lay in the fact that it did not appeal to a class or section of humanity, but appealed to the nature of all men.

The lecturer, who handled his subject in a very able manner, pointed out the leading characteristics of the poet, and, in conclusion, said the best lecture on Wordsworth was that which sent them directly to the study of his writings.

January 21*st*, 1889.—M. L. Lewis, Esq., M.A., LL.M., on "Robinson Crusoe."

The Lecturer remarked that his topic was simple enough, but the subject should be welcome because it enabled them for a few minutes to get back to the time in their personal history when time meant nothing at all. The balance of opinion upon the personal character of his author was rather ambiguously poised. If he was the founder of their fiction he was also a patriarch of the Press. They found him and his writings working behind and influencing almost every detail of politics from the time of James II. to the day of his death His severest critics in their censures only made more manifest his power and energy. Whatever blame he earned—and he earned it mostly by his associates—in ability and character he stood far apart from and above them.

It was stated by some that the work under notice had a personal reference, and the story had been described as an allegory in which the author's public history might possibly be concealed. If that were a correct surmise one peculiarity in the book was accounted for. They had the hero of the story in a position where his character was subject to observation and analysis which might be called microscopic, and yet it seemed to him that the personal character of "Robinson Crusoe" was wonderfully unrevealed. Clear as the outline was, that was the whole of the picture.

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The first part of the book appeared at the beginning of 1719, the second part at the end of the same year. Very likely the second volume was not thought about till the popularity of the first tempted the author to try again. The two parts had very distinct characteristics. The first volume was a philosophic analysis of solitude, and an attempt to deal with the condition of man in a situation of loneliness. The second volume was a book of descriptive travels, and as such was one of the best of its kind. But the second part was in many literary qualities unlike the first, and that was probably what was meant when readers said they thought the first part immeasurably superior to the second. Going into detailed review of the book, the lecturer said he was not at all certain that that part of it which dealt with the desolate solitude of the castaway was the best part of it, but he thought it would not be difficult to make it appear that that was the part which the author valued most himself and considered most important. They would suppose that "Crusoe" was Defoe, and imagine that they had a presentment before them of one of those ancient mariners of whose public life and doings they read so much, and of whose private behaviour they knew so little. They were known to them well enough collectively, and they understood what they were like as they regarded them in their public duties. He could understand that "Crusoe" would have taken well to the business of Sir Francis Drake.

One of his greatest qualities was his successful perseverance. He erred only on the side of over-confidence. It was characteristic of him and men like him not to be aware of their own powers, but rather to take difficulty because it was difficulty and overcome it by self-reliance, energy, and indomitable will. Those were the qualities which inspired that patient labour which kept the castaway in comfort and sanity. Those were at the root of that spirit which fought against bodily illness, and which was rather disgusted with the idea of being eaten by the savages than terrified by the idea of being killed. As they appreciated those matters they recognised the merits of the book as a delineation of that stubborn, dogged perseverance which they were proud to look upon as belonging to Englishmen. It was the amazing self-reliance or self-confidence which was remarkable in Crusoe. He hoped it was no flattery of themselves still to describe it as peculiarly English.

Another item in Crusoe's character was that he was a thoroughly conscientious man, or, in another phrase, he was truly religious. His piety was of the practical kind which had set a distinctive mark upon our history, which saved the country from being absolutely ruined by the Stuarts, and remained in vitality during the earlier times under the Hanoverians. He did not suppose it possible to detect of what denomination "Crusoe" considered himself a member. There was a vast simplicity about that piety of "Crusoe" or Defoe, for he apprehended that if they had the author anywhere it was when he was repenting of his sins under sickness, or teaching the "man Friday" of his God. Yet with all "Crusoe's" sincerity he was not without a catholicity which was

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a fair test of its quality. He was presumably a Puritan, but had a toleration which was possessed by hardly any of them, and he showed that quality best in the religious conversations undertaken by himself and others for the conversion of the savages who became civilised. That practical religion was characteristic not only of "Crusoe" and Defoe, but also of the best men of Defoe's time. He considered him best paralleled by Elizabethan heroes, and they could see him best in that quality by that peculiarity.

In purity of thought and earnestness of purpose Defoe was quite removed from and far ahead of his contemporaries. As to the reasons for the popularity of the book, not only was it popular and national, but it was well it was so, and if its wholesomeness depended on such large and wide considerations its influence ought not to be ephemeral, but ought to remain so long as they had sympathy with the wholesome principles which it professed. If their national morals were in a healthy state they would find continued national sympathy with and appreciation of that novel and novels of that description. Was their first great novel merely a whetstone for trifling wits, or did it retain the hold upon public sympathy which its intrinsic merit deserved? Did the boys of to-day read it? Could they rate it at its true worth in the field of adventurous narrative? Could they be sure that the average boy really preferred his "Crusoe" to the "penny dreadful"? He did not think the average boy was very imaginative, he did not like too much left for his powers to work upon.

Having favourably contrasted "Crusoe" with "The Swiss Family Robinson," the lecturer held that it was its genius of circumstantial invention which gave this work its peculiar charm and rendered "Crusoe" absolutely inimitable. In "Friday" he thought the author had intended a pourtrayal of perfect gratitude. There could be no nobler task for his descriptive pen, and he could not easily delineate a more enticing picture than the single-heartedness and noble-mindedness of that savage.

Turning to the second volume of the work, Mr. Lewis said he could not detect inferiority in style or deficiency in incident. It was not read so much as the other, but he could not tell why. In it they had hints of the commerce of the time, and it enabled them to understand the then condition of European Russia, whilst its descriptive passages were most notable.

February 4th, 1889.—Professor HENRY MORLEY on "The Right Reading of Books. (Professional.)

February 18th, 1889.—H. J. MACKINDER, Esq., (Reader in Geographpy in the University of Oxford) on "Geography and Geography." (Professional.)

March 4th, 1889.—Captain W. DE W. ABNEY, C.B., F.R.S., on "Colour Measures." Illustrated with Experiments. (Professional.)

March 18th, 1889.—G. H. NELSON, Esq., M.A., on "John Ziska."

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THE RHÆTICS OF LEICESTERSHIRE.

By H. E. QUILTER. (Read before Section "C.")

With Notes on some remains of fossil fishes from the Rhætic beds of Leicestershire, by A. SMITH WOODWARD, F.G.S., F.Z.S.

SOME important sections of the Rhætic rocks of Leicestershire have already been fully described in our "Transactions." It is proposed, however, in this Paper, to summarise our present knowledge on the occurrence of this formation in the County and add the result of some recent investigations. Mr. A. Smith Woodward, of the British Museum, has very kindly examined some fish remains from the "bone-bed" of the Spinney Hill sections of these rocks, and "shales" of the South Wigston section, and forwarded some interesting notes, for reading with this Paper.

During the year 1859, Professor Rupert Jones and Mr. James Plant found an outlying patch of Lower Rhætic rocks at Aston, a village about three miles north-west of Castle Donnington. In the following year, Rhætic rocks were exposed in cutting the branch line from the Midland Railway, about half-a-mile south-west of Barrow-on-Soar, to Mountsorrel quarries. The section in the deepest part was as follows:—

	ft.	in.
Sail and Drift	1	0
White marly sandstone	2	6
Black Shales	3	0

Again, in the year 1863, Black Shales of the Rhætic formation were observed in the railway cutting from Leicester to Nuneaton.[1]

The first published notice of the occurrence of Rhætic rocks in the County is apparently that of Professor D. T. Ansted.[2] He says:—"The lower eight or ten feet of Shales exposed near Barrow-upon-Soar belong to this part (White Lias) of the Rhætic series."

Mr. R. Etheridge noted and described the same series:—[3] "An examination of the excellent section near Barrow-on-Soar shewed that above the Black Shales there was a considerable thickness of apparently unfossiliferous grey earthy marl, which I took to represent the upper limit of the Rhætic formation."

In the year 1876, Mr. W. J. Harrison, F.G.S.,[4] noted the occurrence of Rhætics at Spinney Hills, near Leicester. The sections at that time shewed, resting upon 16 feet of "tea-green marls," a characteristic bone-

1 J. Plant, Annual Report Leicestershire Literary and Philosophical Society, 1874, p. 38.
2 The Physical Geology and Geography of County of Leicester, 1866, p. 39.
3 Geological Magazine, 1874, p. 480.
4 Quarterly Journal, Geological Society, vol. xxxii, p. 212.

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bed, in which the usual fossil fish remains were found. Above this were shewn about 10 feet of black laminated shales, the uppermost bed seen being a band of limestone nodules. In these shales the characteristic Rhætic fossils were found, including *Pholidophorus Mottiana* (?) and *Ophiolepis Damesii*. These sections are now covered up.

In a boring for coal near Evington, Leicester, Mr. J. D. Paul, F.G.S.[1] reported that after passing through 186½ feet of Lower Lias, 26 feet of Rhætic rocks were pierced, before the Keuper marls were reached.

Messrs. E. Wilson, F.G.S., and H. E. Quilter have described[2] a very complete section of the Rhætic formation at South Wigston. In a brick-yard pit were shewn 14½ feet of red and grey marls with gypsum, and 15½ feet of "tea-green marls," belonging to the upper Keuper. Resting upon these, 17 feet 10 inches of black, thinly laminated shales,—Lower Rhætic, or *Avicula contorta* series,—passing upwards into 22 feet 5 inches of Blue laminated shales,—Upper Rhætics, or White Lias. Some characteristic fossils were found in the thin pyritous seam representing the bone-bed, and in the lower black shales; the specimens of *Pholidophorus nitidus*, Eg.; described by Mr. A. S. Woodward, were found in these shales.

In a boring for water at Melton Mowbray, A. J. Jukes-Browne, F.G.S.,[3] gives Rhætics:—Dark shaley clay and stone 16 feet 4 inches. Mr. James Plant, however, gives a different thickness;[4] he reports 26 feet of Rhætics, which, he informs me, includes the tea-green marls.

During some excavations on the Spinney Hills, near Leicester, Messrs. E. F. Bates and L. Hodges[5] noted and described beds belonging to the Upper Rhætic and Lower Lias. The sections then exposed about 5 feet of light-coloured marl, resting upon 6 feet of blue marl, containing *Axinus cloacinus*. This was overlain by about 8 feet of Lower Lias.

Since the publication of the foregoing, Messrs. Bates and Hodges have further extended their researches into the Rhætic formation of the Spinney Hills. They have very kindly allowed me the use of their sections and notes for this paper, and their investigations prove of great interest.

There are two series of sections, one series shewing the black thinly laminated shales of the Lower Rhætics, and the other the thickly laminated marly shales of the Upper part (White Lias), one section including a few feet of Lower Lias. It is to be regretted that the excavations from which these sections were taken were not of a greater depth; as it is, the sections exposed and noted, cannot be correlated with sufficient accuracy to form a generalised section. The mean thickness of the Lower and Upper Rhætics on the Spinney Hills is apparently about 26 feet.

1 Annual Report and Transactions, Leicester Literary and Philosophical Society, 1883-4.
2 Geological Magazine, September, 1884.
3 Geology of south-west part of Lincolnshire, etc. Mem. Geological Survey, 1885, p. 147.
4 Report of British Association, 1883, p. 154.
5 Quarterly Transactions of Leicester Literary and Philosophical Society, Oct., 1886.

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The section described by Mr. Harrison at the north-east extremity of the Spinney Hills shewed about 10 feet of the Lower black laminated shales. The sections, as measured by Messrs. Bates and Hodges, shew that as they proceeded in a south-westerly direction, both the Lower and Upper beds of the Rhætic formation gradually thicken. It should be noted that the South Wigston section, where the Lower and Upper Rhætics measured 40 feet in thickness, lies about 5 miles south-west of the Spinney Hills.

Although the distance between these sections of Rhætic rocks is so great, there is a marked resemblance in their lithological characters; the two bands of limestone nodules so well shewn in the South Wigston section being also present at Spinney Hills.

There would appear to be a general uniformity in the lithological characters of the Rhætic formation in Leicestershire. With one exception, all the sections of Rhætics, when complete, have been described as black shales below, passing into lighter coloured shales above; the one exception being the "white marly sandstone" (so called by Mr. Plant) exposed in the branch railway from Barrow-on-Soar to Mountsorrel. This, I think, is an error in description, and is in reality the "grey earthy marl" of Mr. Etheridge's note of the exposure at Barrow-on-Soar.

In the foregoing the "tea-green marls" upon which the black shales rest, have not been classified as Rhætic, being now generally classed as Upper Keuper.

A comparison of the Rhætics of Leicestershire with those of contiguous districts may not be uninteresting.

Mr. E. Wilson, F.G.S., has well described the Rhætics of Nottinghamshire.[1] Here they attain a thickness of 33 feet; the lower beds (*Avicula contorta* series) consisting of 15 feet of shales with bands of limestone and sandstone with bone-beds, and 18 feet of shales and limestone nodules (White Lias).

In Lincolnshire[2] the Rhætic formation apparently does not exceed 33 feet in thickness. A railway cutting at Barnston exposed 15 feet of the *Avicula contorta* beds, as "Paper shales," with thin, variable, yellow sandstones, and 18 feet of thick-bedded, earthy, dark blue shales, with frequent nodules of limestone. At Cotham railway cutting the same series of beds were also noted.

At Grantham, a boring in 1874-6, after passing through Lower Lias, pierced 20 feet of light grey micaceous and sandy clay, and 1 foot 4 inches of very hard stone, resting upon Keuper hard red clay.

The Warwickshire Rhætics[3] do not apparently exceed 30 feet in thickness. The Rev. P. B. Brodie, F.G.S., informs me that a boring at Wilmcote gave 27 feet of Rhætics. No sections have been exposed in the county giving full details of lithological characters.

1 Rhætics of Notts. Q. J. G. S., November, 1882.
2 Geology of south-west Lincolnshire, etc. Mem. Geological Survey.
3 Proc. Warwickshire Naturalist and Archæol. Field Club, 1887.

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LIST OF FOSSILS RECORDED FROM THE RHÆTIC FORMATION OF LEICESTERSHIRE.

PLESIOSAURUS *(remains of).*
ICHTHYOSAURUS *(remains of).*

HYBODUS MINOR. *Ag.*
H. CLOACINUS. *Quenst.*
ACRODUS MINIMUS. *Ag.*
NEMACANTHUS MONILIFER. *Ag.*
GYROLEPIS ALBERTII. *Ag.*
SARGODON TOMICUS. *Quenst.**
SAURICHTHYS ACUMINATUS. *Ag.*
S. APICALIS. *Ag.**
CERATODUS LATISSIMUS. *Ag.*
PHOLIDOPHORUS NITIDUS. *Egerton.*

PLICATULA (OSTREA) INTUSSTRIATA.
PECTEN VALONIENSIS. *Dep.*
CASSIANELLA CONTORTA. *Port.*
CARDIUM RHÆTICUM. *Merian.*
MODIOLA MINIMA. *Sow.*
AXINUS CLOACINUS. *Oppel.*

OPHIOLEPIS DAMESII. *Wr.*
ESTHERIA MINUTA.

* See following notes by Mr. A. S Woodward.

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ON SOME REMAINS OF FOSSIL FISHES FROM THE RHÆTIC BEDS OF THE SPINNEY HILLS, LEICESTERSHIRE.

By A. Smith Woodward, F.G.S., F.Z.S., of the British Museum (Natural History).

The researches of Messrs. E. Wilson and H. E. Quilter upon the Rhætic Beds of Leicestershire have resulted in the discovery of a number or fragmentary remains of fossil fishes, which are of considerable interest for comparison with similar fossils occurring in corresponding deposits elsewhere. Through the kindness of the discoverers, I have lately had the opportunity of making a detailed study of the collection; and the following is a list of the recognisable species obtained by Mr. Quilter from the Spinney Hills, accompanied by brief descriptive notes, and a few observations suggested both by a study of these and other English Rhætic remains.

SELACHII.

1. Hybodus minor, L. Agassiz (Rech. Poiss. Foss., vol. iii., 1837-43), p. 48, pl. viii. *b*, fig. 2, 3, and p. 183, pl. xxiii., figs. 21-24.

Numerous very small teeth are referable to the species named *Hybodus minor* by Agassiz, and the base of one tooth attains a width of nine millims. The specimens do not add anything to known facts; but interesting considerations are suggested by the study of such perfect examples as are some of these.

The species was originally founded upon a ribbed dorsal fin-spine before the discovery was made that spines of this form characterised both *Hybodus* and *Acrodus*: and the teeth were associated with the first-described fossil on theoretical grounds. It must be admitted, however, that these teeth differ very markedly from those of some of the more typical species of *Hybodus*, and there is still some doubt as to their precise generic determination. The root is horizontally expanded, as in the Lower Carboniferous *Cladodus*, and as in the Coal Measure teeth found associated with the dorsal fin-spines named *Ctenacanthus hybodoides*. The spines of *Ctenacanthus* (and *Sphenacanthus*) only differ essentially from those of *Hybodus* in the circumstance that the two series of posterior denticles are not placed mesially, but form small tubercles upon the lateral edges of the hinder face. Precisely the same arrangement of the denticles is observed in the Rhætic dorsal fin-spine, *Nemacanthus*, which is generically distinguished by its lateral ornament and anterior keel; and it is quite possible that the teeth now assigned to

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Hybodus minor will eventually prove to belong to the shark armed with these spines.

2. HYBODUS CLOACINUS, F. A Quenstedt (Der Jura, 1858, p. 34, pl. ii., fig. 15).

Fragments of the teeth of a typical species of *Hybodus* of considerable size also occur in Mr. QUILTER'S collection, and these may be identified with *Hybodus cloacinus*, Quenstedt, described from the Rhætic of Würtemberg. The species has not hitherto been recorded from England, though typical examples appear to have been obtained from all the bone-beds, and one has already been figured under the name of *H. reticulatus*, Ag.[1] The teeth are robust, but narrow and much laterally elongated, the principal coronal eminence being relatively slender and bluntly pointed, but its height not equalling half the length of the crown. There are three or four short, blunt lateral cones on each side; and the superficial coronal wrinkles are large, generally few and widely spaced.

A ribbed dorsal fin-spine (*Hybodus austiensis*, Davis[2]) sufficiently large to have pertained to this species is known from Aust Cliff.

3. ACRODUS MINIMUS, L. Agassiz (Poiss. Foss., vol. iii., 1839, p. 145, pl. xxii., figs. 6-12).

Many of the small Leicestershire teeth of *Acrodus* are typical examples of the Rhætic species named *A. minimus* by Agassiz; but many are more acutely ridged, becoming assignable to *A. acutus*, Agassiz;[3] while a few are comparatively smooth, and well represent the supposed genus *Thectodus*, determined by Meyer and Plieninger[4] from the Rhætic of Würtemberg. Of these teeth, however, there are many thousands in the Moore collection of the Bath Museum, obtained from the Rhætic of Holwell, near Frome;[5] and an examination of specimens from all the known localities reveals so many intermediate gradations between the extreme forms, that it seems quite impossible to recognise more than a single species. The variations in shape and ornamentation exhibited by the detached teeth are certainly greater than such as are to be observed in the completely preserved dentition in some of the Liassic species;[6] but the discovery of groups of teeth of *Acrodus minimus* arranged in order, must yet be awaited before its precise definition and comparison with later forms can be attempted.

4. SELACHIAN SPINES

The only fragment of a dorsal fin-spine contained in the collection, is the apex of a very small example of *Nemacanthus*,[7] displaying a single series of three relatively large posterior denticles.

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1 R. Etheridge, Proc. Cardiff Naturalists' Society, vol. iii., pl. ii.
2 J. W. Davis, Quart. Journ. Geol. Soc., vol xxxvii. (1881), p. 416, pl. xxii., fig. 1.
3 L. Agassiz, *Op. cit.*, vol. iii., p. 146, pl. xxii., figs. 13-15.
4 H. von Meyer and T. Plieninger, Palæont. Württembergs (1844), p. 116.
5 C. Moore. Quart. Journ. Geol. Soc., vol. xxiii. (1867), p. 483.
6 *Acrodus Anningiæ* (Agass z), E. C. H. Day, Geol. Mag., vol. i. (1864), pl. iii. See also figures of *Acrodus nobilis* in the present writer's Catal. Fossil Fishes, British Museum, pt. i, pls. xiii., xiv.
7 L. Agassiz, *Op. cit.*, vol. iii. (1837), p. 25. J. W. Davis, Quart. Journ. Geol. Soc., vol. xxxvii. (1881), p. 418.

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An imperfect hooked cephalic spine *(Sphenonchus)* of a Hybodont Shark is also preserved, but does not admit of precise determination and description. Such spines are known to characterise *Hybodus*, *Acrodus*, and *Strophodus*;[1] and some have already been described from the Rhætic Bone-bed of Aust Cliff.[2]

GANOIDEI.

5. Gyrolepis Albertii, L. Agassiz (Poiss. Foss., vol. ii., pt. i., 1843, p. 173, pl. xix., figs. 1-6.

A large number of scales of *Gyrolepis* occur, and are evidently similar to those met with in the Rhætic Beds of Aust Cliff, near Bristol, and Axmouth, Devonshire. The latter examples were referred by Agassiz[3] to *Gyrolepis Albertii*, *G. tenuistriatus*, and *G. maximus*; but recent researches upon more satisfactory fossils from the German Muschelkalk have suggested[4] that the three forms of scale thus named pertain to one and the same fish. *G. Albertii* (which is the name to be retained) is based upon scales of the flank; *G. tenuistriatus* refers to the scales of the upper lobe of the tail; while *G. maximus* is the name probably applied merely to the large most anterior flank-scales.[5]

A very careful examination of the large number of fragments assignable to this species has revealed nothing beyond undoubted scales. It ought, however, to be remembered, that, if the affinities of the small Mesozoic mammal, *Microlestes*, are rightly determined,[6] it will probably prove to have the lower premolars compressed and obliquely grooved, like those of the Purbeckian *Plagiaulax*; and such fossils may readily escape notice among scales of the form of *Gyrolepis*, if not subjected to a minute examination.

6. Sargodon (?) *sp.*

A few minute hemispherical dental crowns are of the form described as *Sphærodus* by Agassiz.[7] This name, however, has been given to the rounded crushing teeth of very distinct genera, and has thus only a provisional significance. In the present case, it is not unlikely that the fossils pertain to the Lepidotoid ganoid of which the front teeth are known as *Sargodon*.[8] The largest example is not more than 3 millims. in diameter; and all the specimens are distinguished from the rounded teeth of the Triassic genus *Colobodus* by the absence of an apical tubercle. The cutting teeth of *Sargodon* do not occur in Mr. Quilter's collection.

7. Saurichthys acuminatus, L. Agassiz (Poiss. Foss., vol. ii., pt. ii., 1843, p. 86, pl. lv*a*, figs. 1-5).

1 Smith Woodward, Ann. & Mag. Nat. Hist. [6] vol. ii. (1888), p. 340.
2 J. W. Davis, *loc. cit.*, p. 420, pl. xxii., fig. 7. Also "*Cladodus curtus*," *ibid*, fig. 9.
3 L. Agassiz, *Op. cit.*, vol. ii., pt. ii., p. 285.
4 W. Dames, Palæont, Abhandlungen, vol. iv. (1888), p. 143.
5 W. Dames, *loc. cit.*, p. 151.
6 H. F. Osborn, Journ. Acad. Nat. Sci., Philad. [2] vol. ix. (1888), p. 214.
7 L. Agassiz, *Op. cit.*, vol ii., pt. i. (1843), p. 15.
8 H. von Meyer and T. Plieninger, *Op. cit.*

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The majority of the teeth of *Saurichthys* contained in the collection are very typical examples of the "species" named *S. acuminatus* by Agassiz. They are stout, and the terminal cap of enamel extends over half, or more than half of the total height of the tooth; the basal portion exhibits a small central cavity, and is vertically striated; the enamelled upper portion is solid, faintly bicarinate, and with prominent superficial striæ, extending nearly to the apex upon one side, but very short upon the other.

One or two smaller and more slender teeth also occur, exhibiting precisely the characters of the so-called *S. longidens*, Agassiz;[1] and other varieties are not very unlike the teeth named *S. apicalis*, Agassiz.[2] It seems, however, impossible to attempt specific determinations from such evidence: and the slight information already acquired concerning the jaws to which most of these teeth originally belonged, is suggestive of considerable variation in the dentition of different parts of the mouth.[3] *Saurichthys* appears to have been a long-snouted fish, probably closely related to *Belonorhynchus* and to the Keuper fish whose jaw was originally supposed to pertain to a Pterodactyle.

DIPNOI.

8. Ceratodus latissimus, L. Agassiz (Poiss. Foss., vol. iii., 1838, p. 131, pl. xx., figs. 8, 9).

A fine tooth of *Ceratodus*, and a fragment, are indistinguishable from some of the common forms from Aust Cliff, referable to *C. latissimus*. The nearly complete tooth measures between 6 and 7 centims. in its longer diameter, and is completely detached both from its supporting bone and from the matrix. The coronal surface is irregular and comparatively flat; there are distinct indications only of three outer "horns," or denticles, though there may have been a fourth small one; and the relative breadth of the tooth suggests that it pertains to the upper jaw.

Agassiz (*tom. cit.*) originally distinguished several "species" of *Ceratodus* upon the evidence of detached teeth from Aust, and Higgins[4] named some others; but there is so much variation in the form of these fossils that, as already recognised by Beyrich[5] and Miall[6], the majority must be provisionally grouped under one comprehensive species. The German Professor suggested the name of *C. anglicus* for the group, and the English Professor, *C. polymorphus*: but Agassiz' first name is sufficiently appropriate to secure priority, and must thus be adopted.

1 L. Agassiz, *Op. cit.*, vol. ii., pt. ii., p. 87, pl. lv*a*, figs. 17, 18.
2 *Ibid.*, p. 85, pl. lv*a*, figs. 6-11.
3 Smith Woodward, Ann. & Mag. Nat. Hist. [6] vol. iii. (1889), pp. 301, 302, pl. xiv., figs. 7, 8.
4 In Morris' Catal. British Foss., 2nd edit. (1854).
5 E. Beyrich, Zeitschr. deutsch. geol. Gesell., vol. ii. (1850), p. 159.
6 L. C. Miall, Monogr. Sirenoid and Crossopt. Ganoids (Mon. Pal. Soc., 1878), p. 28.

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NOTE ON A SPECIES OF *PHOLIDOPHORUS* FROM THE RHÆTIC PAPER SHALES OF WIGSTON.

By A. Smith Woodward.

Three small ichthyolites obtained by Mr. Edward Wilson, F.G.S., from the Paper Shales of Wigston, are referable to a small species of *Pholidophorus*, probably identical with a form already described by Sir Philip Egerton from the Rhætic beds of Aust Cliff, near Bristol. The first is of small size, not exceeding 2 inches in total length; and the three examples may be enumerated as follows:—

1. Head and trunk, displaying the pectoral, pelvic, and anal fins.
2. Imperfect trunk, with the dorsal fin, the greater portion of the caudal, and traces of the pectorals.
3. Caudal pedicle, with a few well-preserved scales and the greater portion of the caudal fin.

Collating the information afforded by these three specimens, the general form and proportions of the fish are found to be somewhat as indicated in the accompanying outline-sketch.

The head and opercular apparatus occupy about one-fourth of the total length; and the greatest depth of the trunk, immediately in advance of the dorsal fin, bears the same ratio to the length. The caudal pedicle is also stout.

Of the head and opercular apparatus, no details are capable of precise recognition; but the general features discernible suggest agreement with the corresponding parts in the typical species of *Pholidophorus*.

Of the paired fins, the pectorals (Nos. 1, 2) seem to have been well-developed; and the pelvics (No. 1) are small, and placed about half-way between the pectorals and the tail. The dorsal fin (No. 2) is directly opposite to the pelvic fins, and is short, probably consisting of not more than nine rays. The anal fin is about equal in size to the dorsal, and placed somewhat nearer to the caudal than to the pelvics. The caudal fin (Nos. 2, 3) is robust and slightly forked, consisting of distally bifurcated rays, and in No. 2 exhibiting some of the characteristic fulcra above.

The scales of the flank are not sufficiently well preserved for description, but those supporting the lateral line, with the series above

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and below, are evidently much deeper than long. Upon the caudal pedicle, most of the scales are shewn in No. 3. These are smooth and diamond-shaped, without posterior serrations; and each of the series supporting the lateral line is not only ridged, but notched postero-inferiorly.

The genus *Pholidophorus*, as finally adopted by Agassiz, contained several extraneous forms; but it is obvious, from the foregoing description, that the Wigston fish precisely accords in generic characters with the typical species, *P. Bechei*. Only three such species appear to have been hitherto recorded from the Rhætic; and it seems unnecessary to pass beyond these to institute satisfactory comparisons with the form now described. *P. Higginsi*, Egerton,[1] from the Cotham Marble of Aust Cliff, is at once excluded from consideration on account of its comparatively robust proportions: and *P. Roemeri*, Martin,[2] from the Rhætic of Hildesheim, differs from the Wigston fossil in the greater slenderness of its trunk and the more posterior situation of the dorsal fin. In every known particular, however, the specimens agree well with the Cotham species named *P. nitidus* by Egerton,[3] and under this name I would venture here to place them on record

It may be added that a species of *Pholidophorus* from the Leicestershire Rhætics has already been noted under the undefined name of *P. Mottiana*;[4] but the publication of a precise definition has yet to prove the distinctness of this form from *P. nitidus*. To facilitate reference, Mr. WILSON has generously presented the new fossils to the British Museum.

1 Sir Philip Egerton, Figs. and Descrips. British Organic Remains (Mem. Geol. Survey, 1855), dec. viii., No. 7, p. i., pl. vii., fig. 1-5.
2 K. Martin, Zeitschr. deutsch. geol. Gesell., vol. xxvi. (1874), pp. 816-819, pl. xxix. figs. 1, 2.
3 Sir Philip Egerton, *loc. cit.* no. 7, p. 3, pl. vii., figs. 6-8.
4 W. J. Harrison, Quart. Jour. Geol. Soc., vol. xxxii. 1876, p. 212.

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FRUITS.

By the Rev. T. A. Preston, M.A. (Read before Section "D.")

We know that the Fruit of a plant is derived from the flower, and that, unless there be a flower of some kind or other no fruit will be produced. It will be as well, therefore, to enumerate all the different parts which are found in flowers, though in certain flowers some of them are absent.

Beginning, then, from the centre of the flower (after fertilization has taken place) we shall have the following:—

(1) the Seed.
(2) the Carpels, the part to which the seeds are attached being the Placenta.
(3) the Stamens.
(4) the Petals.
(5) the Sepals.
(6) the Thalamus, or Receptacle, on which the above are situated; and outside the flower we have
(7) the Bracts.
(8) the Peduncle.
(9) the Leaves of the plant.

As every flower has not all the above-named parts, it stands to reason that all fruits are not formed entirely from the same parts of the flower; but it cannot be too carefully borne in mind that, however few parts there may be in a flower, no *new structure* enters into the fruit, though, on the other hand, some of the parts of the flower may be suppressed during the ripening of the fruit. This will help us much in understanding the true structure of the fruit, for many parts become singularly altered during growth; and though the coverings of the fruit are called the *exo-*, *meso-*, and *endo-carp*, these names have been given, quite irrespective of the parts of the flower from which they took their origin. The object of this paper will be to trace the origin of the different parts of some few fruits.

The great changes undergone during the maturation of the fruit arise (1) from excessive development of some parts more than of others; (2) the consequent suppression of other parts; (3) the union of adjacent parts, or the fusion of two adjacent whorls; and (4) the (comparatively rare) *apparent* development of extra parts. Instances of the first three of these will be frequently mentioned, whilst examples of the fourth will be given later on.

The Ovules (*i.e.*, the seeds before fertilization takes place) take their origin in most cases from the Carpels; most usually from the edge, but

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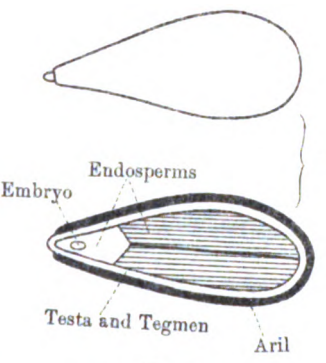
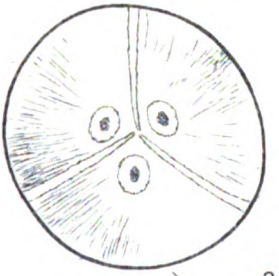
FRUITS.

Rev. T. A. Preston.

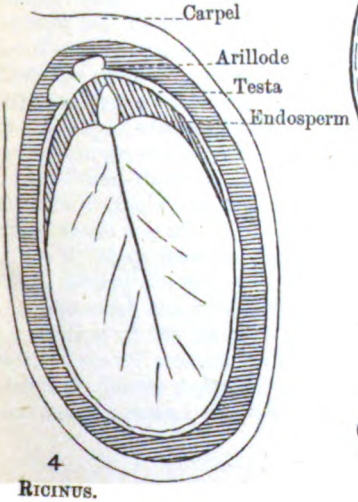
1
Bryophyllum.



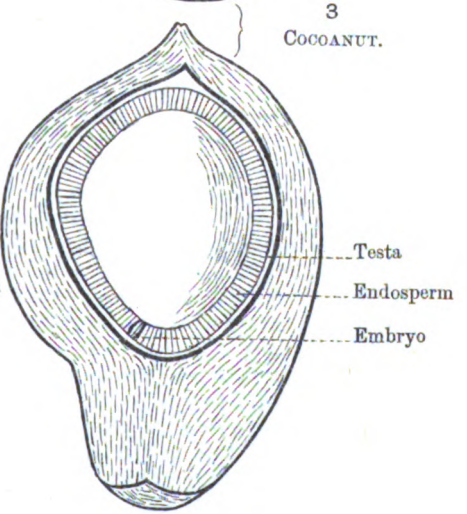
2
Water Lily.



3
Cocoanut.



4
Ricinus.



5
Willow.

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sometimes from the surface. Visitors to Brazil will be presented by their friends on leaving with a few leaves of the *Bryophyllum* (fig. 1), or Fortune plant, (because "as long as you keep these leaves you will not want for money;" I cannot say I have experienced the truth of this statement). These leaves have to be pinned up against the wall of the cabin, and by the time England is reached almost every indentation in the edge of the leaf will be furnished with a young plant (as if a seed had been placed there originally), though there would be no trace of such a growth when the leaf was gathered. It will not be very difficult, therefore, to understand that a Carpel may be considered to be only a leaf folded over, so that the edges of the two sides fell on one another and were then united. As a leaf consists of an upper and under surface with more or less cellular matter (or *parenchyma*) between, we shall have to bear in mind that the petals, sepals, and other leaf-like organs also have these three parts, and thus the number of points to be attended to is greatly increased, for any one of these can be modified, without affecting the others.

To proceed, then, to a consideration of the several parts of the flower, as enumerated above.

(1) The Seed. The seed contains the *Embryo*, consisting of a plumule, a radicle, and one or two cotyledons. This Embryo may take up the whole of the interior, as in the Pea or Bean, with its thick, fleshy cotyledons, or may occupy but a small part of the cavity, the remainder being filled up with *Endosperm*, the name now given to what used to be called Albumen. In Angiosperms the Endosperm is only formed after fertilization, but in Gymnosperms it is present before that takes place. The Endosperm is of very varied consistency, sometimes farinaceous, as in Corn, sometimes horny, sometimes pulpy, sometimes ultimately hard and white, as in the Vegetable Ivory. In a few plants it is actually of two distinct kinds, as in the White Water-lily (fig. 2), in which the Embryo is situated in a fleshy Endosperm, the other part being farinaceous. The Embryo and Endosperm are protected by one or two integuments, called the Tegmen and Testa. In the Walnut there is only a Testa, in the Mistletoe there is neither The inner of these (the Tegmen) occasionally helps to form part of the Endosperm, and disappears, but the outer one (the Testa) is almost invariably present. When, then, we have a fruit put before us, we must look for the Embryo, and then for its coats, and, having found these, we can tell whether Endosperm is present or not. It is often difficult to find the Embryo, but there are various helps which can be made use of. For instance, the coats of the seed do not *entirely* cover it, they leave a small aperture, called the *micropyle*, towards which the radicle, as a rule, always points. If the seed be soaked and then squeezed, the fluid will be seen to run out from the micropyle, and the position of the Embryo can be discovered. But this cannot always be done. Take a Cocoanut, for instance (fig. 3); we see a thin outer skin, then a mass of fibrous matter, then a hard shell, coated inside with the pulpy mass usually eaten. Where is the Embryo? Strip off the fibrous coat,

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and at one end of the hard shell we observe three circular scars with a trace of three lines between them; these lines represent the edges of three Carpels, but as there is but one cavity inside the Cocoanut, it is evident that two Carpels have been suppressed. If we try these scars we shall find that one is very much softer than the other two, and by carefully examining the pulp inside this scar we shall find the Embryo; in fact, it is not at all uncommon to find that it has already begun to germinate by the time it reaches England. This embryo has no covering, consequently we conclude that the pulp is Endosperm, and the thin brown skin between it and the shell is the Testa. Another very interesting seed is that of the Castor Oil Plant (*Ricinus*) (fig. 4), where the Cotyledons consist of two very delicate leaf-like membranes, and lie in the midst of a plentiful Endosperm, from which the oil is extracted.

Of the two coverings of the seed, the Testa and Tegmen, the latter, as has been mentioned, is often partially or wholly modified to assist in the formation of the endosperm, but the Testa is almost always distinct. It is very variable in appearance,—shining, wrinkled, spiny, or cottony,—but there is no difficulty in determining its presence.

But besides these coats, the seed sometimes exhibits an additional coat or appendage, formed during the ripening of the fruit, though present in a rudimentary state in the flower. Of this kind is the *Aril*, found in some plants, which may be considered to be an outgrowth from the "funiculus" or stalk by which the seed is attached to the carpel. Thus in the White Water-lily a coat grows down from the funiculus over the seed, almost completely covering it when ripe; in the Willows, a tuft of hairs grows out from the funiculus, and forms a coat to the seed (fig. 5); in the Yew (fig. 6) a red Aril, which ultimately becomes pulpy, grows round the ripening seed, forming a cup; the Mace, again, is an Aril covering the seed of the nutmeg (fig. 7).

Another covering, formerly included in the term Aril, but now called an *Arillode*, originates near the micropyle and is found in the Spindle-tree (fig. 8), the Spurges (fig. 9, as in *Ricinus*) and Polygala. Many of these, however, merely form spongy masses at one extremity of the seed, and certainly do not constitute a covering.

(2) The Carpels. The difference between Angiosperms and Gymnosperms is that the seeds of the former are protected by a Carpel, while those of the latter are not; but though the carpels do not act as a covering to the seed in Gymnosperms, they are still present, and often assume the same form as that of the leaf of the plant. Thus in *Cycas revoluta* (fig. 10), the carpels are shaped like the leaves of the plant, with long narrow pinnæ, the lower pinnæ being modified into seeds; and though the carpel is distinguished by a felt-like covering, it is impossible not to see its close analogy to the leaf; in fact, it is often only by their position that carpels can be detected, so much do they resemble the ordinary leaves of the plant.

The fruit of the Pine Tribe is called a Cone, and authors are not yet fully agreed as to its real structure. The scales of the cone are usually

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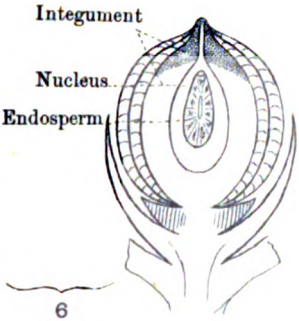
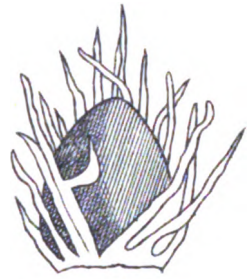
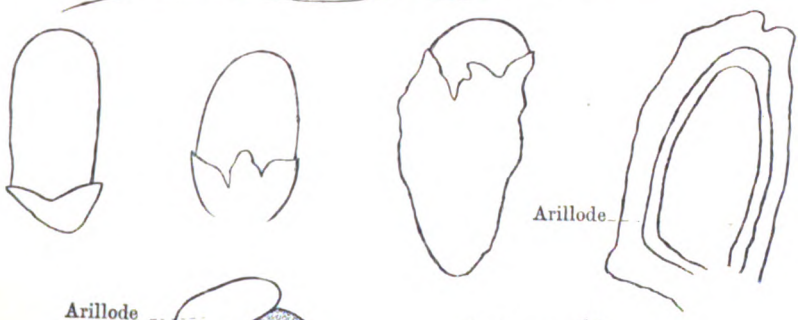


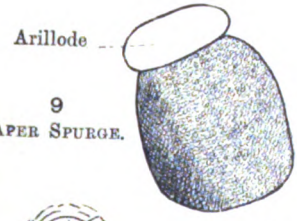
6
YEW.



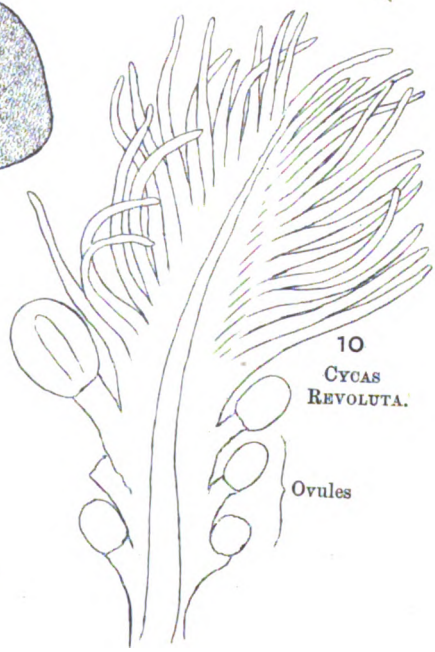
7
MACE.

8
SPINDLE-TREE.

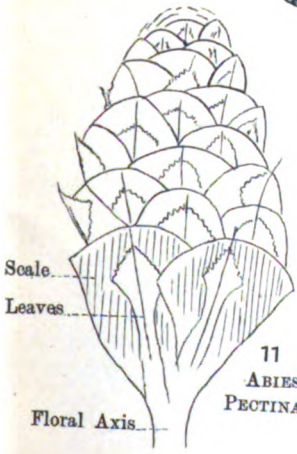




9
CAPER SPURGE.



10
CYCAS REVOLUTA.



11
ABIES PECTINATA.

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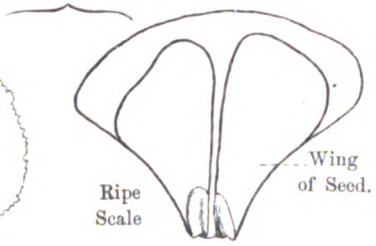
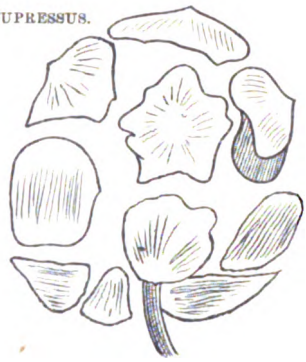
12
–Seminiferous Scale.

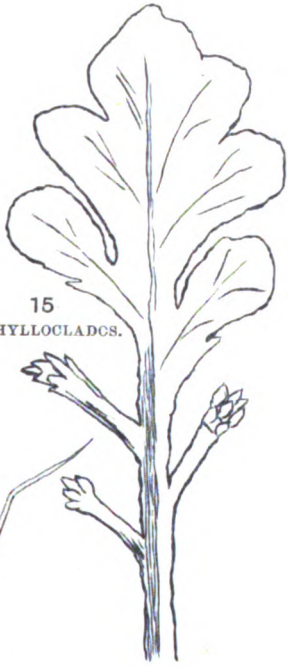


13
Cupressus.



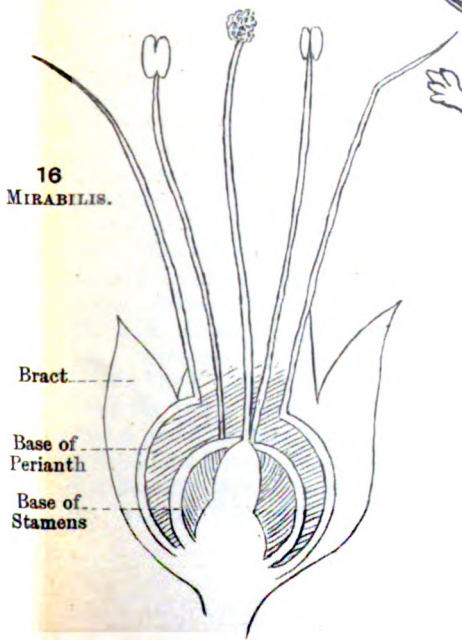
14
Thuja

15
Phyllocladcs.

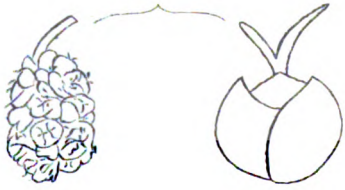


17
Mirabilis.

16
Mirabilis.



18
Mulberry.



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considered as bracts; Sachs, however, says, "The cone of *Abies* is a metamorphosed shoot" (fig. 11). It will be observed that besides the bract, the seeds are attached to a broad plate, called a "seminiferous scale" (fig. 12). "The seminiferous scales appear to be axillary structures in the axils of the bracts, which spring from the axis of the cone; but really the seminiferous scale itself arises on a protuberance at the base of the bract, and is therefore not axillary. The bract grows very little afterwards, but the protuberance increases greatly, and produces two ovules. The seminiferous scale must, therefore, be considered as a greatly developed *placenta* growing out of a carpel, which is very small or even abortive. The whole cone is therefore a single flower, with a number of small open carpels (hitherto considered as bracts), which are far outstripped in their growth by the seminiferous placentæ." Much as there is to recommend this theory, all botanists are not agreed as to its correctness.

The round fruits of the Cypress (*Cupressus*, fig. 13) and those of *Thuja* (fig. 14) consist of carpels which become woody and assume the form of stalked peltate scales, or valves, separating from one another longitudinally. In *Phylloclados*, again (another genus of Gymnosperms, fig. 15), "the lower lateral branchlets of the leaf-like flattened shoots are transformed into fertile flowers, which are raised upon a pedicel and are swollen above into the form of a club, the large ovules standing in the axils of small leaves. The small scales, from the axils of which the ovules spring, may be regarded as carpels."

In Gymnosperms, then, though the seeds are not protected by a covering of carpels, as in Angiosperms, carpels are present in many of them, and curiously modified; in others, however, no part of the fruit can be considered as at all connected with a carpel.

In Angiosperms carpels are necessarily present, and (as may be expected) present very different appearances. The *Pod*, splitting up on both sides, and the *Follicle*, splitting up on only one, are easily recognised. When the carpel is one-seeded and forms a hard, dry covering to the seed, it is called an Achene; when the parenchyma becomes fleshy, it is called a drupel, and when also the inner skin becomes hard and stony, a drupe. In the case of the Cocoa nut, the thin outer skin is the outer skin of the carpel, the fibrous part the parenchyma, and the hard internal shell the inner skin.

(3) The Stamens. I can find no really certain instance where the Stamens enter into the composition of the fruit. In the Butcher's Broom (*Ruscus*) the ovary is surrounded by a tube of barren filaments, but, as in Geranium, this tube doubtless splits up and withers as the ovary increases.

(4) The Petals. When a calyx also is present, I know of no instance where the petals enter into the composition of the fruit but where they form a *perianth*, they do so, but rarely. In the Marvel of Peru (*Mirabilis Jalapa*), in which the perianth is coloured like a corolla, the base of it becomes indurated and persistent, forming a covering to the fruit (fig. 16). In this plant also the lower parts of the filaments of the

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stamens are united into a spherical covering for the ovary (fig. 17), but I cannot say whether this covering remains with the fruit. In the Mulberry the perianth and the carpels are fused together and become swollen and succulent (fig. 18).

(5) The Sepals. If we examine a very young flower of the Pear (fig. 19), we shall see that the calyx forms a cup-shaped receptacle, at the bottom of which are a number of papillæ, of which the five central ones are carpels, and the others round them rudimentary stamens and petals. As the flower grows, the sides of this "cup" increase and carry with them the stamens and petals, leaving the carpels below. As the fruit ripens, the sides of the cup become succulent, and the sepals (or the limbs of the leaves of which they are formed) dry up and form a tuft at the top. Is the fruit, then, formed of sepals or of receptacle, or of both combined? A vertical section of an Apple will shew a very distinct circular mark, which is the line of separation between the carpel and the calyx (or calyx and receptacle combined). The horny plates of the "core" represent the inner skin of the carpel, the outer skin with the intervening parenchyma becoming pulpy and succulent to form part of the "pome." As for the outer succulent portion, we are led to consider it as made up of the calyx and receptacle combined, for M. Planchon records an instance of a Quince, where the fruit was surmounted by five leaves and the surface marked by five prominences, which apparently corresponded to the five stalks of the calycine leaves. "In this specimen, then, the inferior position of the ovary appeared to be not so much due to an expansion of the fruit-stalk as to the fusion of the hypertrophied stalks of the sepals." —*(Masters' Teratology p. 71.)* Fruits of this kind are really composed of carpel, calyx and receptacle.

Another interesting modification of the calyx is met with in *Compositæ*, in which the limb of the calycine leaf is converted into a number of hairs (or pappus) as in *Carduus* (fig. 20), whilst the lower part is closely adherent to the ovary, In the Dandelion (fig. 21), the upper part of the calyx tube is greatly lengthened out, forming a beak or stalk for the pappus, which spreads out horizontally at the top to form a kind of parachute.

In *Trifolium subterraneum* the extraordinary modification of some of the calyces, though not strictly composing the fruits, assists the ripening of the fertile flowers. A fertile flower, after the fall of the petals, is given in fig. 22. The barren calyces appear at first like a tuft of white fleshy tapering fibres; afterwards five points or teeth shoot out from the apices of the fleshy fibres, representing the calycine teeth. "At first both the peduncles and flowers are parallel to the prostrate stems; but after flowering, the peduncle bends at the extremity, so that its apex is directed vertically downwards. At this time the growth of the barren calyces presses back the spreading fertile ones, until these are so much reflexed as to be parallel to the peduncle in a direction contrary to their original one, with their mouths directed away from its apex, and consequently towards the sky; preserving this direction, they bury them-

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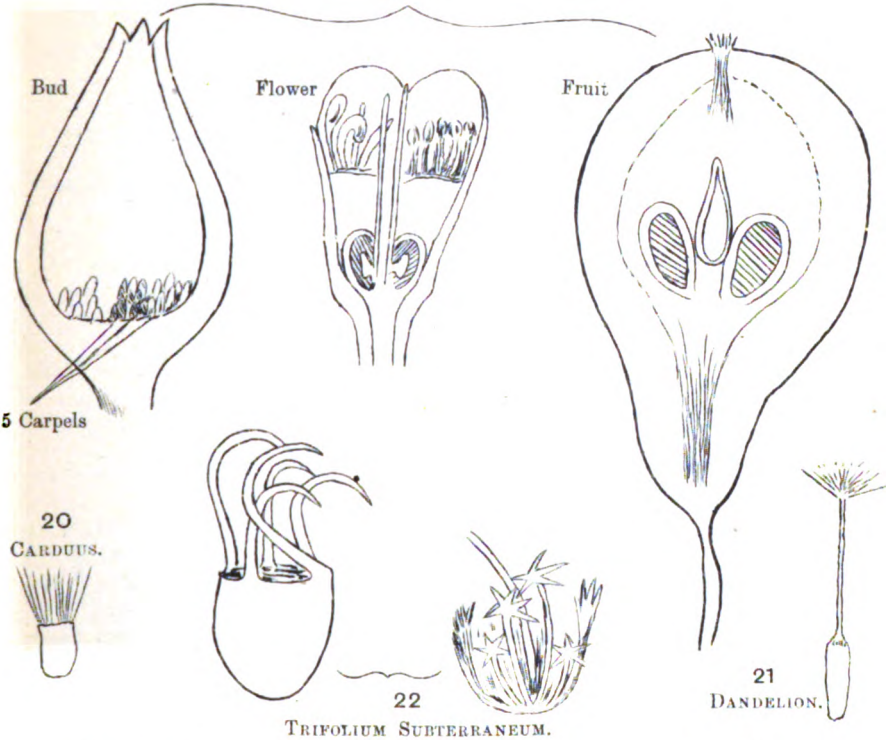
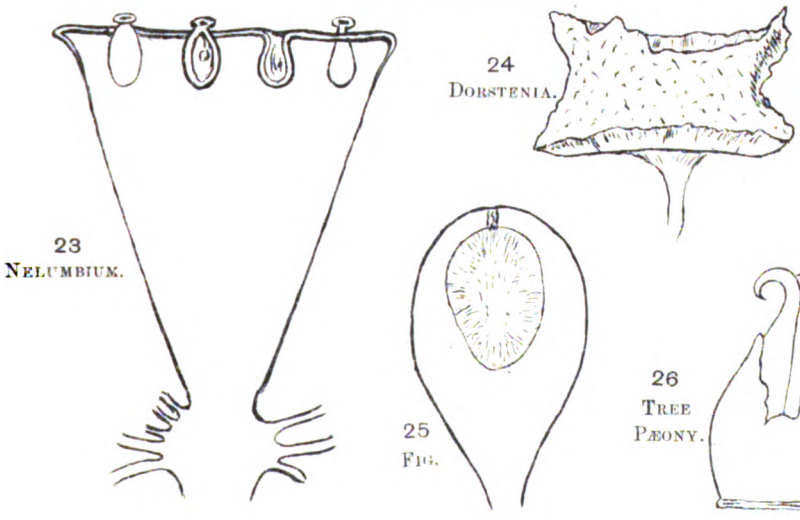
19
PEAR.





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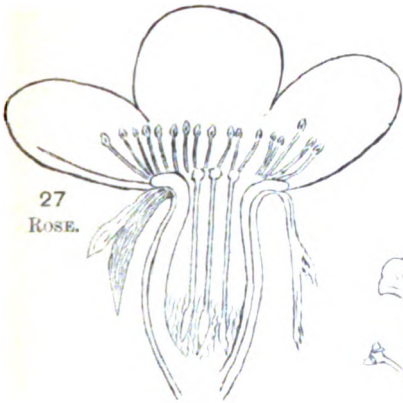
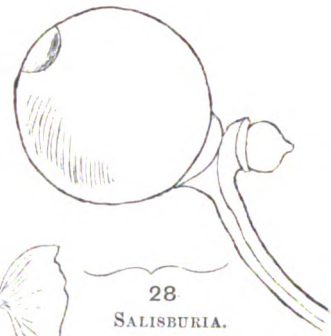
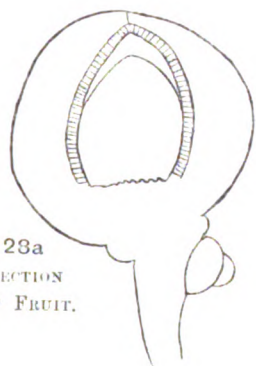


27
ROSE.



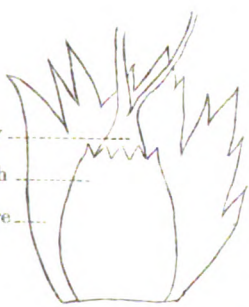
28
SALISBURIA.

29
ACORN.



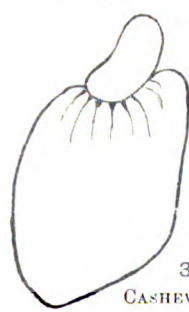
23a
SECTION
OF FRUIT.

30
HAZEL.



Ovary
erianth
volucre

31
HAZEL NUT.



32
CASHEW NUT.

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selves in the earth, and become rooted beneath the surface by the filaments issuing from the apex of the head, while the reflected barren calyces protect the pods in their passage downwards."—*(Syme.)*

(6) The Thalamus. In the *Nelumbium*, or Sacred Bean, the (fig. 23) Thalamus is greatly developed, forming a large obconical mass, with the carpels lodged in a number of pits in the broader end, the whole looking very like the rose of a watering-pot. In the *Dorstenia* (fig. 24) the receptacle is spread out into an oblong plate with the edges turned up, resembling a tea-tray, on the upper surface of which both barren and fertile flowers are situated. If we imagine such a receptacle closed up into a pear-shaped mass, we get the Fig (fig. 25). The "setting" of the seed of the Fig is often rendered more certain by shaking the branches of another plant over it, not to "pollinize" the flowers in the manner adopted with some Palms, but to shake a kind of beetle on to the young Figs, which enters at the top, and, running about inside, scatters the pollen from the barren to the fertile flowers. In the Tree Pæony (*P. moutan*) the Thalamus partially covers the outside of the carpels, appearing very like an Aril (fig. 26), but as an Aril is an appendage of the seed, not of the carpel, there ought to be no confusion as to its real structure. In the Rose (fig, 27) the receptacle forms a cup, with the achenes attached to the base; but as in the case of the Pear, this cup-like receptacle may be considered as the Thalamus fused with the lower part of the sepals.

Among the Gymnosperms "the fertile flowers of the Maiden hair Tree *(Salisburia adiantifolia)* spring from the axils of foliage leaves belonging to short lateral branches, which annually produce new rosettes of leaves (fig. 28). The single flower consists of a stalk like axis, which bears immediately beneath its apex two (rarely three) lateral ovules," and after fertilization the Thalamus expands and grows over the ovule, thus forming a "berry."

(7) The Bracts. We have already considered the Cone of the Fir, in which the scales are generally considered as Bracts; but the "cup" of the Acorn is undoubtedly formed of Bracts (fig. 29). In the Hazel-nut the cluster of fertile flowers is protected by a number of small scale-like bracts, giving it very much the appearance of an ordinary leaf-bud (fig. 30); but in addition to these each flower has at its base a small bract, which in the full-grown nut appears as an involucre (fig. 31).

(8) The Peduncle. In the Cashew Nut (fig. 32) this swells out, ultimately becoming larger than the seed, and succulent; whether it can be strictly regarded as part of the fruit is doubtful: at all events it must aid in the dispersion of the seed by its esculent qualities, and is therefore noticed here.

(9) The Leaves. In the Juniper (fig. 33) the branches are terminated by a whorl of three ovules, and the leaves are also arranged in whorls of three. "The ovules apparently alternate with the three leaves of the upper whorl, and hence must be themselves considered as metamorphosed leaves. These leaves of the upper whorl swell after fertilization, grow

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together, and form the pulp of the Juniper berry, in which the ripe seeds are entirely enclosed; they may therefore be considered as carpels."

In the Sweet Chestnut (*Castanea*, fig. 34) the young flowers are protected by an involucrum of bracts, flat and rather leaf-like; the spines with which the involucre of the ripe fruit is so plentifully clothed are stated by Le Maout to be abortive branches situated in the axils of these foliaceous scales.

We have thus examined a certain number of fruits, in which different parts of the flower have been more or less modified, and I have endeavoured to take, in almost all cases, examples in which only one part has been especially altered; but many fruits, as in the case of the Apple or Pear, will be found to have more than one set of parts so modified. In these cases it is often impossible to understand the structure without tracing the development from the first. Let us examine, however, a few of the more simple instances. If we take an apple we see at the top the remains of the Calyx, and we know therefore that Calyx and Carpel must enter into the structure. On cutting the apple in halves horizontally, we see the seeds in the five cells, and about half way between the cells and the skin a circle of dots. Taking, now, a vertical section, we see a marked line enclosing the "core," of which the dots in the former case were evidently a section. This line will then point out the separation between Calyx and Carpel; the horny plates lining the cells will represent the inner skin of the Carpel and the skin of the Apple will be the outer skin of the Calyx, the pulpy mass of the Apple consequently being made up of the parenchyma and outer skin of the Carpel together with the parenchyma and inner skin of the Calyx.

Take now a Cherry; it will easily be seen that the remains of the Calyx are at the top of the stalk and are quite independent of the fruit; consequently we know that the Cherry consists only of Carpel and Seed, the fruit being called a drupe.

Take next an Orange. The small scale, often seen at the bottom of the Orange, is the Calyx; consequently the Orange must consist of Carpels and their contents. We shall easily see that the seeds have their proper coverings, and the fruit must therefore be developed from the Carpels; but when we cut the Orange across (fig. 35) we see the cells filled with a pulpy mass without any separation from the seeds, which, in fact, lie embedded in the mass, and we must come to the conclusion that the Carpels are represented by the outer yellow rind (corresponding to the outer skin of the Carpel) the pithy part (corresponding to the parenchyma), and the thin skin surrounding the "quarters" (corresponding to the inner skin of the Carpel). But what, then, is the pulpy mass which we eat? If it is formed from any original structure, it can only be from the placentæ, and this is the generally received opinion. Another opinion is that "at a very early period, multicellular protuberances are developed from the innermost layer of the tissue of the wall of the multicellular ovary, which gradually fill up the loculi of the fruit."

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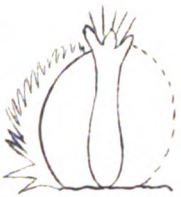
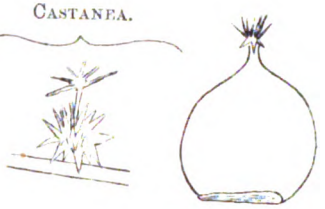
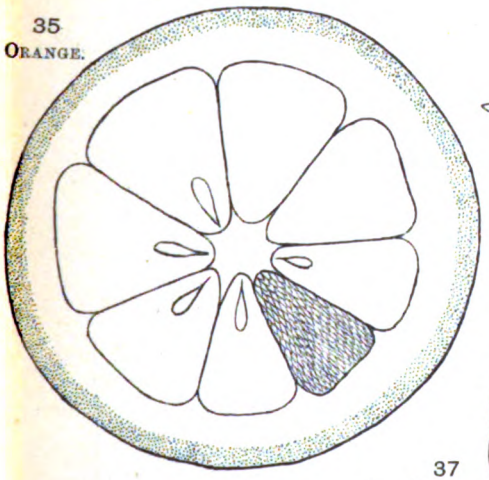
33
JUNIPER.



34
CASTANEA.

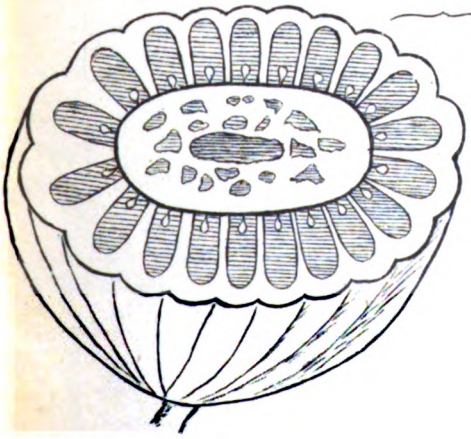


35
ORANGE.

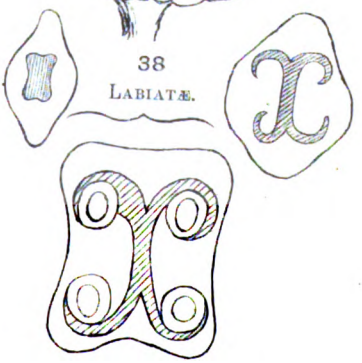


36
ORANGE.

37
ORANGE.



38
LABIATÆ.



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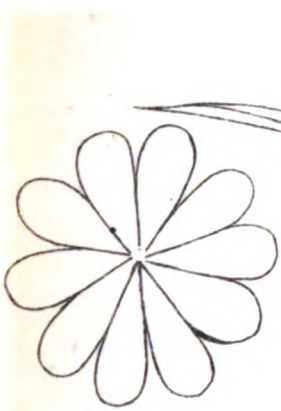
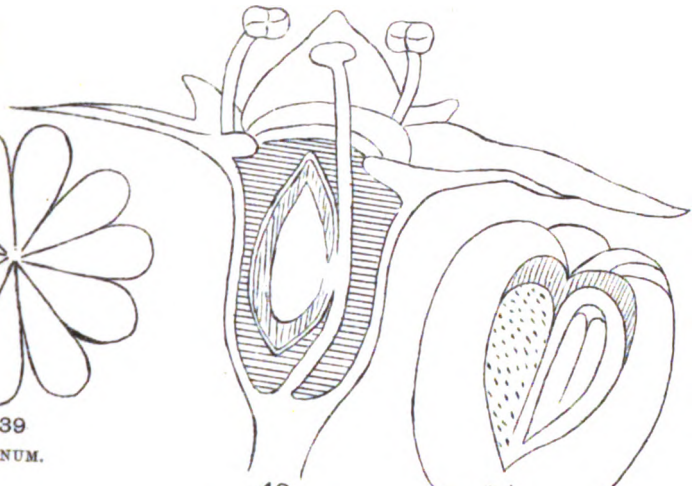
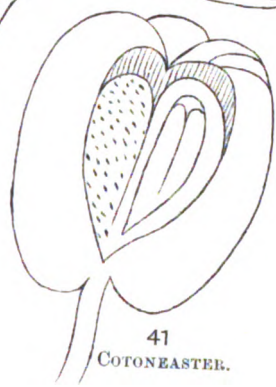


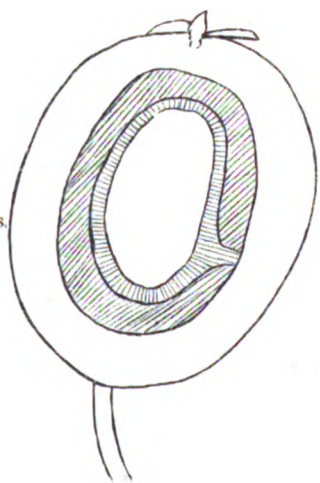
39
LINUM.



40
ALCHEMILLA.



41
COTONEASTER.



42
CRATÆGUS.

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But we have not yet done with our Orange. Monstrosities are often of great use in enabling us to understand a doubtful structure. Now the Orange is very apt to assume monstrous forms. In one of these the Carpels separate and the fruit appears spread out like a hand (fig. 36. In the figure only two are represented, but sometimes there are as many as five). In another the Carpels are all separate, but enclosed in a kind of cup, evidently an expansion of the receptacle (fig. 37); hence some botanists consider that the outer coat of the Orange is formed from receptacle as well as Carpels.

A few words must now be said about the apparent development of extra parts, I say, *apparent* development, for with the exception of the embryo and endosperm (in some cases) I stated that no new structure, not found in the flower, was developed during the maturation of the fruit.

The *Labiatæ* appear to have four single-seeded nuts in the ripe fruit, but really there are only two carpels (fig. 38). At first, there is but a single four-sided cell. As growth proceeds, this cell, by the increase of the walls, assumes the form of an X, and then, by an outgrowth from the top and bottom, this cell becomes divided into four. In the *Datura*, again, at first there are only two cells in the ovary, but as the seeds ripen, two extra partitions are formed. In *Linum* there are at first five cells, but these ultimately become converted into ten (fig. 39). In *Cruciferæ* there is originally but one cell, but as growth continues a projection springs out from the placentæ on each side, the two meeting in the centre, and thus dividing the single cell into two. The line of juncture of these two "false dissepiments," as they are called, can be readily seen, and the junction is so slight that the partition can be easily divided along that line. In the Pods of *Leguminosæ* both longitudinal and transverse partitions will be readily seen to be but mere outgrowths from the placentæ.

If, then, we bear in mind how greatly the appearance of the fruit can be altered by the modification of a single part, we shall be able to trace a close connection between fruits apparently very dissimilar. In the *Rosaceæ*, for instance, we meet with an astonishing number of apparently very dissimilar fruits, but as the structure of the flower in all is very similar, we may expect to find a very great similarity in the structure of the fruit. We will begin with the achene: in *Potentilla fragariastrum* we have a number of achenes on a flat receptacle; in *Fragaria* this receptacle is swollen up into a succulent mass; in *Alchemilla* the achenes are contained in a hollowed-out receptacle (fig. 40); in *Cotoneaster* (fig. 41) they are contained in a close-fittting succulent receptacle, giving the fruit the appearance of a berry; in *Cratægus* (fig. 42) the achenes are reduced to one, and the coats so hardened as to make the fruit like a drupe; and in *Rosa* the achenes are contained in a cup-shaped fleshy receptacle. In all these, then, the achene is essentially the same, though its coats may be more or less hardened, whilst the receptacle (or this and the calyx) is more or less modified. Imagine next the achenes

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of the *Potentilla* to be modified into drupels, and we get the Blackberry; if the receptacle is swollen, but not succulent, we get the Raspberry. The modification of the achene into the drupe of the Cherry or Plum has already been alluded to; and the modification of the carpel into the Apple or Pear has also been noticed. And, finally, the carpel of Spiræa, containing more than one seed, and splitting up on one side, is a follicle.

A similar variation in the fruits of other orders, much as they may appear to differ at first sight, will be found to result from similar modifications of only one or two of its parts.

On the other hand, fruits which go by the same name may really be essentially different in structure, though similar in appearance. Consider how many different structures are included under the term Berry, even among those fruits we have been considering. Such names, truly, are most misleading, and are apt to give a totally wrong idea of the structure of a fruit, but perhaps enough has been said to show how varied, and yet interesting, is this subject which I have but just been able to glance at.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

LIST OF PAPERS READ.

October 16, 1888.—"The Beaumonts of Gracedieu," by Mr. A. H. PAGET.

November 20, 1888.—"*Sartor Resartus*," by Mr. WM. JACKSON.

January 15, 1889.—"Character and Character Drawing," by Mr. A. P. MOORE, M.A.

February 21, 1889.—"Robert Louis Stevenson," by Mr. C. J. BILLSON. M.A.

The average attendance of Members and Associates has been 10.

A. H. PAGET, *Chairman.*

SECTION "C."

FOR GEOLOGY.

This Section now meets, as a rule, once each quarter, according to a resolution passed at the last Annual Meeting.

Feb. 13, 1889.—A very interesting *Paper* was read by Mr. H. E. QUILTER on "The Rhætics of Leicestershire, with notes on some remains of Fossil Fishes from the Rhætic Beds of Leicestershire, by A. SMITH WOODWARD, Esq., F.G.S., F.Z.S. There were eight present. This Paper will be found at page 14 of the present number of the "Transactions."

Dr. CLEMENTS was admitted as a Member. Mr. DRAPER stated that Mr. ELLIS had, through him, given the Section an invitation to visit the Barrow Works.

The following Resolution was passed: "That this Meeting requests Members of the Section to kindly send a post-card to the Secretary, with information respecting all new excavations that may come under their notice in the town and neighbourhood, so that arrangements may be made for some one to specially visit and examine them if thought necessary."

C. A. MOORE, *Chairman.*

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SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

December 19, 1888.—The CHAIRMAN announced that Mr. F. BATES had presented another handsome gift to the Society, for the special use of this Section, consisting of Savile Kent's great work on the "Infusoria" and Hudson and Gosse's "Rotifera," in all five large volumes, with numerous coloured plates, handsomely bound; also two boxes containing 12 dozens of microscopic slides of vegetable sections, spores, etc. A cordial vote of thanks to the donor was passed, but it was felt that such gifts could scarcely be utilised on account of the miserable accommodation that was provided at the Museum for the Society's Sections.

Paper. The Rev. T. A. PRESTON read a paper on "Fruits" describing their origin from various parts of the Flower, viz.: the *ovule*, *testa*, *funiculus*, *aril*, *placenta*, *carpel*, *filaments*, *receptacle*. *perianth*, and *peduncle*. All fruits and seed vessels were formed by combinations and developments of some or all of these parts, and nothing not occurring in the flower did or could occur in the fruit; but some fruits were so strangely abnormal that it was difficult to determine which parts of the flower were concerned in their production. The paper was illustrated by a number of outline drawings, and a fine collection of natural specimens. This Paper is printed at page 24 of this number of the "Transactions."

The CHAIRMAN said he was not aware of any work in which this subject was treated exactly from Mr. Preston's point of view.

Exhibition of Winter Flowers.—Several Members exhibited interesting collections of wild and cultivated flowers, the unusually mild and open weather being particularly favourable to late and hardy species. The collection prepared by the Rev. T. A. PRESTON included over 120 varieties, mostly from the open air, with a few from the greenhouse. In all about 130 distinct forms were exhibited.

January 16, 1889.—The evening was devoted to the microscopic examination of the slides of Diatoms, Sections, etc., presented by Mr. F. BATES. Microscopes were brought by the CHAIRMAN, Mr. E. F. COOPER, and Dr. TOMKINS making with the large binocular belonging to the Society, and the smaller instrument belonging to the Museum, five in all. Time would only allow of a small portion of the collection of slides being examined. Many of these were found to be very beautiful and interesting, and gave rise to some instructive conversation.

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Exhibits, by the CHAIRMAN, a sheet of *Amadou* or German Tinder, about six inches square, made from the fungus *Polyporus fomentarius* and some other woody species by maceration and beating. It had the appearance and texture of very soft thick Chamois leather.

By Dr. FINCH, leaves of *Cineraria* shewing the tortuous burrows of some insect larva under the skin. Mr. VICE believed they were made by the larva of a dipterous insect.

February 20, 1889.—Dr. COOPER in the chair, in the absence of the Chairman.

Exhibition of Early Flowers and Foliage.—By Dr. FINCH; Crocus, daisy, snowdrop, pear, wallflower, primrose, Christmas rose, and the curious greenhouse plant *Aspidistra elongata variegata*, a Japanese species which does well in windows, as it bears the effects of gas. It is allied to the lilies but produces its flowers close to the ground.

By Mr. CARTER, a specimen of *Orobanche elatior*, found by Mrs. MACAULAY, near Kibworth. A species new to the County. Parasitic on the root of *Centaurea scabiosa*.

Paper by the CHAIRMAN, on "The Ferns of Leicestershire," read by Dr. COOPER. This was followed by some discussion as to the reason for the scarcity of seedlings of the Brake-fern. Mr. CARTER suggested that as the plant had acquired a creeping rhizome, which rendered it practically immortal, there was little necessity for propagation by spores, and possibly the majority of the myriads of spores still annually produced had become incapable of germination.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

December 10.—Mr. W. P. PYCRAFT was elected an Associate of the Section, on the proposition of Mr. MONTAGU BROWNE, seconded by Mr. W. A. VICE.

Mr. MONTAGU BROWNE read a communication dealing with the occurrence of Cetacean remains in the County. In his opening remarks he drew attention to two portions of rami of the mandibles of a huge Whale, closely resembling the existing *Balæna mysticetus*, which were found during the excavations for the Abbey Park, Oct., 1880, and forwarded to the Museum. The largest (or condylic) portion was described by Mr. F. GRIFFITH, C.E., who was on the spot at the time, as resting upon gravel, at a depth of ten feet under apparently undisturbed soil. The bone was subsequently examined by Professor W. H. FLOWER,

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F.R.S., who agreed with Mr. BROWNE that they had no doubt been brought from a distance and used for posts, or similar purposes, at some remote period, and afterwards buried in alluvium, or gradually covered over with soil, etc. As bearing upon this aspect of the question attention was called to the presence of the rami of the mandible of a large Whale, shewing evidence of considerable antiquity, which, as recently as 1883, were in use as an entrance archway to a garden at Knossington.

The condylar portion of another ramus, said to have been found at Newfound Pool on December 17th, 1887, was also shewn. This latter, which was for some time on view in the town prior to its deposition in the Museum, was originally described by Mr. JAS. PLANT, F.G.S., as a portion of the femur of *Elephas primigenius*, and, subsequently, as the *scapula* of a Whale, of great antiquity.

The error of both these views was demonstrated by Mr. BROWNE, in a review of the anatomical features of the specimen, which was shown to bear not the slightest resemblance in shape or size to either of the bones mentioned.

The CHAIRMAN in supplementing Mr. BROWNE'S remarks, bore testimony to the untenability of the hypothesis which would accord an extreme antiquity to specimens of this nature, and stated that he had that afternoon tested a piece of the Newfound Pool ramus, in order to ascertain whether the animal matter had entirely disappeared, as had been asserted. On the contrary he found a very considerable amount still remaining, thus proving conclusively that the specimen could not be of any very great age.

Mr. H. E. QUILTER brought some notes on recent additions to the County list of Mollusca, in which he chronicled the following species which had turned up during the summer—*Helix nemoralis*, var. *depressa*, from near Fleckney; *H. hortensis*, Tilton-on-the-Hill; *H. hortensis*, var. *lutea* (12345), Asfordby; *H. arbustorum*, gravel-pits, Smeeton; *H. arbustorum*, var. *marmorata*, from the same locality; *H. ericetorum* var. *lutescens*, from near Fleckney; *Pupa umbilicata*, var. *curta*, from Woodhouse Eaves.

He also exhibited a fine series of specimens of *Helix nemoralis* from different localities, and made some interesting remarks on the probable influence of the various situations on the number of shell-bands, etc.

The SECRETARY then contributed a note upon a Tick (*Ixodes erinaceus*, Aud) taken from a Stoat sent to the Museum in 1885. The species was fully described, and attention directed to the chief points of interest in its structure; a short account of the characters and habits of the family *Ixodidæ* was also given.

Objects exhibited.—Portions of the rami of mandibles of Whales, from excavations in the County, by Mr. MONTAGU BROWNE. Various shells from the County, and also the following species from Bristol, viz.:

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Helix aspersa, var. *exalbida*; *H. cantiana*, var. *albida*; *H. hortensis*, var. *albina*, by Mr. H. E. QUILTER. Various *Lepidoptera*, by Messrs. F. BOUSKELL and B. HEADLY. Micro slides and drawings of *Ixodes erinaceus*, and specimen of *Stenopteryx* from the Swift, by the SECRETARY.

January 14, 1889.—Dr. J. T. DAVIES, of Windermere House, Aylestone Road, was elected an Associate of the Section, on the proposition of Mr. MONTAGU BROWNE, seconded by the CHAIRMAN.

A *Paper* was then read by the SECRETARY entitled "The Life-histories of some Animal Parasites," in which the various opinions which have been successively held as to the true nature and relations of the Acarids commonly termed Hypopi were reviewed and examined, followed by an account of the Liver Fluke *(Fasciola hepatica)*, which was taken as a type of the Order *Trematoda*.

After describing the adult animal, the development of the young from the ovum was traced from its first appearance as a free embryo, through the successive stages of Sporocyst, Redia, and Tailed Cercaria, to the original condition. The various incidents which mark the way of the young Fluke in its progress towards maturity were given in detail, and the chief points of interest in the paper were illustrated by means of numerous diagrams and microscopical preparations.

Objects Exhibited.—Local *Lepidoptera*, by Mr. F. BOUSKELL; Slides of *Gamasus*, and *Distomum lanceolatum*, with specimen of *Fasciola hepatica*, by the SECRETARY.

February 11*th.*—Mr. E. PATTISON, of Regent Street, was elected a Member of the Section, on the proposition of the SECRETARY, seconded by Mr. MONTAGU BROWNE.

A *Paper* on "The recent immigration of Sand Grouse (*Syrrhaptes paradoxus*)" was then read by Mr. W. P. PYCRAFT, which comprised a full and most interesting account of the visits which have been paid by this bird to the British Islands. The course taken by them in each case was described, and the various localities visited duly noted, together with dates, etc. An examination was also made of some of the theories which have been advanced to account for their irregular migration.

In the discussion which followed, the CHAIRMAN, in touching upon the various explanations which have been offered to account for the migration of the bird under consideration, stated that it had been variously supposed to proceed either from an inherited tendency to migrate at various times, or from an overcrowding of the species which would cause numbers to forsake their usual localities.

The former of these hypotheses he looked upon as the most reasonable, viz.: that the birds were probably descended from ancestors whose habit it was to migrate at certain seasons, and that this tendency, considerably modified, still persisted. He also went on to show the fallibility of the overcrowding theory, remarking that the first intimation of their

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position which the birds would have, would be their straitened circumstances as regards the food supply, and that their condition would not then be one to permit of such extended flights as they are known to take.

Mr. BROWNE gave some interesting information respecting the power of flight possessed by *Pterocles* from personal observations in Spain and elsewhere.

Mr. W. P. PYCRAFT stated with regard to the migration of *Syrrhaptes*, that he agreed with the Chairman respecting the inherited tendency; he did not think either the theory of over-population, or another, which would make a sandstorm the factor in driving the birds from the usual habitat, sufficiently explained the various circumstances of the case.

After some further remarks by other members, a vote of thanks to Mr. PYCRAFT, proposed by Mr. MONTAGU BROWNE and seconded by Mr. F. F. HOW, was carried unanimously.

Objects Exhibited.—Plate of *Syrrhaptes paradoxus* from the forthcoming "Vertebrate Animals of Leicestershire and Rutland;" Map shewing their occurrences in the British Islands, and mounted sternum of the bird, by Mr. W. P. PYCRAFT.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. A. H. PAGET, West Walk.

Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

The Meetings are held in the Council Room, Town Museum, at 7 p.m. on the third Tuesday in each month.

A. H. PAGET, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephens' Road, Leicester.

EVENING MEETINGS.—The third Wednesday in each month, at 7 p.m., at the Museum.

1889.

April 17.—Reports from Members as to the earliest appearance of migratory Birds.
Exhibition of the flowers of bulbous plants, hardy or greenhouse.
Paper on "The Native Bulbs of Leicestershire," by the CHAIRMAN.

May 15.—Exhibition of rare or curious or local Birds' eggs.
Paper on "The Colours of Skin and Hair in certain Races of Mankind," by Mr. J. J. W. KNOWLES.

June 19.—Exhibition of *Aphides* (smother-flies) of various species.
Paper on "House Flies," by Mr. W. A. VICE.

EXCURSIONS.

The second Wednesday in each Summer month, at about 3 p.m.

April 10.—To Braunstone. Time and route will be notified on circular.
May 8.—To the Spinney Hill Park. Meet at the Park gates at 3.30.
June 12.—To the Botanical Garden in the Abbey Park. Meet at the Clock Tower at 3 15 p.m.

SECTION "E."

Chairman—F. M. POPE, M.B., Campbell Street.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

April 8.—Paper by Mr. W. A. VICE, M.B. "The *Halteres* of the *Diptera*, their structure and function" (illustrated).

May 6.—Election of Officers. Short communication by the SECRETARY—"A simple form of Constant-pressure Injecting Apparatus." Exhibition of Lepidopterous larvæ, by Mr. G. H. STORER.

June 3.—Notes and Exhibits by various members.

The Paper for the Evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL SOCIETY.

NEW QUARTERLY SERIES.

PART XII., JULY, 1889.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 24TH, 1889.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
1889.

[*Price Sixpence.*]

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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

The FIFTY-FOURTH ANNUAL GENERAL MEETING of the Society was held in the Lecture Hall, Town Museum, on Monday evening, the 24th of June, 1889, at 7 o'clock.

A. H. PAGET, Esq., Retiring Vice-President, in the Chair.

The CORRESPONDING SECRETARY (Mr. CHARLES J. BILLSON, M.A.) read the Annual Report of the Council, and presented the Reports and Transactions of the Sections.

The Financial Statement, as audited, was then read by the Financial Secretary, Mr. GEORGE HULL.

Moved by the CHAIRMAN, seconded by Mr. J. M. GIMSON :—

(1) "That the Annual Report and Financial Statement be adopted and printed for circulation."

The retiring VICE-PRESIDENT then vacated the Chair in favour of J. D. PAUL, Esq., F.G.S., the new President, who addressed the Meeting.

The PRESIDENT then announced that as only a sufficient number of persons had been nominated to fill the several offices, no voting for any of the Officers would be required.

The PRESIDENT, therefore, declared the several gentlemen named in the Nomination List duly elected.

Moved by Mr. T. ELGOOD, seconded by Mr. E. F. COOPER :—

(2) "That the thanks of the Society be given to the Honorary Secretaries and other Officers of the Society for their services during the past year; to the Representatives of the Local Press for their reports of the Society's proceedings; and to the Curator for his services to the Museum."

Moved by the PRESIDENT, seconded by Mr. C. J. BILLSON :—

(3) "That Mr. E. CLEPHAN and Mr. T. C. LEE be elected Auditors for the ensuing year."

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THE THEORIES AS TO THE VARIATIONS OF RACE IN MANKIND.

By J. J. W. Knowles. (Read before Section "D.")

The ancient Theological and Academical notion of the origin of Mankind was that at a certain definite, though undefined, period in the existence of this earth Humanity was suddenly introduced upon this world's stage. Its condition being of a particularly happy character, was denoted by the terms "Age of Innocence," "Golden Age," &c. Circumstances, variously accounted for according to the various speculations of the diverse peoples who indulged in them, brought about a disturbance of that condition. This disturbance was of an evil tendency, so that degeneracy took place, through stages passing from bad to worse, and indicated by the terms Silver, Bronze, and Iron Ages. These notions were mainly dependent upon tradition, and more or less connected with religious teaching.

Modern ideas upon this subject are influenced by Science and Research, and modern theorists are divided into two camps, while there are still those who are content to abide by the ancient opinion.

The two modern camps range themselves under the respective banners of "Unity of Origin" and "Diversity of Origin," modified in the former case by adhesion to one or other of the principles

(a) that Man is the outcome of the working of Nature by development, in accordance with a general fiat of a Great First Cause;

(b) that he is due to the special creative act of the same Great Cause.

Those who support the "Diversity of Origin" view incline also to the second of these principles; and in this they are, to some extent, at one with the ancient teaching.

In one particular all seem to agree—viz.: that the original locality of Man, whether he may have been produced spontaneously or by a directly creative act, or successive and independent acts, is found in the district comprised in or adjacent to the country now known as Persia.

It should here be noted that those who maintain the Unity theory are willing to admit the development principle, so far as may suffice to enable them thereby to account for the diversity of the Human race as it now exists.

It is of these two theories, "Unity of Origin" and "Diversity of Origin," that I now treat.

Without altogether ignoring those records and traditions which for so many centuries dominated human belief and speculation, and which,

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if properly regarded, are not quite devoid of weight and influence in this matter, I may say that the evidence of the date of Man's production and the conditions of his early existence upon the earth is derived by all the modern schools of philosophers from five different sources :—

(1) Geology, (2) Archæology, (3) History, (4) Language, (5) Ethnology.

Geology supplies us with the material evidence of the first dawn of Humanity upon our planet.

Archæology follows with collections of pre-historical memorials of Mankind at a far more recent period of the world's existence, when Nature had assumed her present aspect, and organic life, as it now is, had commenced its course.

History, in which may be included not only information obtained from contemporaneous records which are History proper, written with the ends of History in view, but also from inscriptions, delineations, &c., not directly designed as Historical data—as well as well-founded Tradition—brings before us the various races of men, individualized as it were, which, through the Historic era, have peopled the habitable parts of the globe.

Language traces the races of Mankind back to their diverse beginnings.

Ethnology assigns to each race its proper place in the procession of Human life upon the earth.

GEOLOGY.

The commencement of the Tertiary System was the dawn of the present state of Nature upon the earth. The Tertiary System has been divided by geologists into different successive epochs or eras :—the *Eocene*, the *Miocene*, the *Pliocene*. These eras are succeeded by two others, which complete the Geological scale :—the *Post-Pliocene*, the *Recent*. During the Pliocene era there occurred what is known as the Glacial period. During this Glacial period there is no evidence, as far as human research has reached, that Man was an inhabitant of the earth.

Man's advent to this planet is, owing to the latest research and consequent discovery, admitted to have taken place during the Post-Pliocene period.

The first traces that have been detected of Man's existence on earth present themselves in the form of certain rude works of art, the products of an inventive intellect denied to the brute—such as hatchets, spears, arrow-heads and knives, coarsely chipped out of flint. No great amount of skill is exhibited in their fabrication, and none of them appear to have been ground and polished like the stone implements of a later period.

The situations in which such relics are found are in accumulations of gravels, the sites of ancient river-beds, and in caves, the depth and state of solidity of the superincumbent deposit being an index and guage of its antiquity. Intermingled with these stone implements are found

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bones of animals long extinct, or whose habitat is now far removed from where the remains of their former congeners are exhumed—such as the mammoth, the woolly rhinoceros, the cave bear, cave lion, cave tiger, cave hyæna, &c., all extinct animals of the Post-Pliocene period, and the reindeer and Irish elk; together with tools of bone, fragments of sun-baked urns, rounded slabs of slate of a plate-like form, broken pottery, calcined bones of undomesticated animals, used for food, charcoal and ashes, and, in some few remarkable instances, with portions of human skeletons. These human remains are said to exhibit structural peculiarities that distinguish the human beings to which they belonged from present races of men. It is also worthy of notice that there is utter absence of any indications that these men were anything but carnivorous in their feeding.

ARCHÆOLOGY.

The "Pre-historical" era, though remote, is *modern* when compared with the epoch that witnessed the manufacture of the flint implements that lie buried with the mammoth remains in gravel-beds and caves.

The most ancient and complete memorials of this era are found in Denmark and Switzerland. In Denmark they are associated with certain bogs that fill up interstices in the Boulder clay, and with some ancient refuse-heaps, called kitchen middens, fringing the Baltic shores of Denmark; and in Switzerland with what are known as Lake dwellings, since they are found adjacent to or within the verge of the Swiss Lakes.

The peat in the bogs consists substantially of three layers:—in the lowermost layer are found the remains of huge *pine trees*; in the layer above, *mighty oaks*; and in the superficial layer, *great beech trees*. Now, besides the fact that the pine and the oak no longer are found in Denmark, the peaty matter in which they are embedded must in each case have taken centuries, probably thousands of years, to accumulate.

In the lowest layer, associated with the remains of the ancient pines, stone implements alone are found, but they are ground and polished, and, though rude of form, they exhibit a great advance in the art of manufacturing such articles when compared with the chipped hatchets, spear heads and knives found in the gravel and caves. All traces of extinct animals are lost, though there are found remains of many beasts no longer inhabitants of that locality.

The human skulls that have been recovered from the "Pine Layer" testify that the men of those days were of small stature, with broad, round heads and heavy over-hanging eyebrows, resembling in aspect the modern Laplanders. The bones of beasts include large quantities of those of such animals as are now domesticated; but there are no traces of grain or any indications that a knowledge of agriculture then existed.

Among the Oaks, swords and shields of bronze have been brought to light, and in the more recent Beech deposits implements of iron appear for the first time.

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The human remains of the Bronze and Iron Ages indicate a different race from those of the Stone Age:—the skulls are more elongated in form and larger in dimensions. There are evidences, too, that the Eastern custom of burning the dead was practised by these people. Stone weapons continued to be used, but bronze implements were added to them, generally made after the pattern of the stone weapons; and the remains of cereals and of domestic oxen, sheep and pigs, shew that agricultural and pastoral pursuits had begun to be cultivated.

In the "Kitchen Middens" situated on the East coast of Denmark, and composed of heaps of waste, oyster and other shells, and the refuse of remains of beasts and birds—belonging to or allied to the *ferœ naturæ* of modern Denmark—are found flint knives and hatchets, correspondent in character to those of the "Pine" peat-bogs; other instruments of stone, horn, wood, and bone, with fragments of coarse pottery, abound, but no implements of bronze, much less of iron.

With regard to the Swiss "Lake Dwellings." In the most ancient of these relics, found principally in the Eastern Lakes, no implements but those of stone, horn and bone have been discovered; while in the settlements that belong to the Bronze Age, situated in the Western and Central Lakes, a great abundance and variety of weapons and utensils of Bronze have been dredged up, some of them bearing a close resemblance to those of corresponding age in Denmark.

In some of the dwellings of the "Stone" period, articles have been found which tend to shew that the people who inhabited them were more advanced than those of the Stone Age in Denmark. The remains of plaited cloth, of polished hatchets of serpentine and greenstone, of flint arrow-heads, of blades of silex edged or toothed, serving as knives or saws, of stone hammers and anvils, of bows of yew, of awls and needles of bone, and of fragments of pottery made by hand. There are also mats of hemp and flax, cords and cables made of fibres and bark, fishing nets and small baskets, bone hairpins, bracelets, toys and stone quoits.

All these Lake dwellers appear to have domesticated the ox, the sheep, the goat, and the dog; and lumps of carbonized wheat and barley that have been found lead to the conclusion that they had some acquaintance with agriculture.

HISTORY.

The principal standard ancient historical authorities are:—the Genesis of Moses; the preserved records of Egyptian historians; other Egyptian writings; delineations and monuments of contemporaneous events; Babylonian and Assyrian relics; the traditions of the Chinese; and the Indian Vedas.

Whatever may be the views in other respects with regard to the Mosaic Genesis, there appears to be no doubt as to the authenticity of the book and the *bonâ fides* of its author. Though that author, of course, makes no pretence at chronology with reference to the Christian era, it has been satisfactorily shewn, from data that would be accepted on

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behalf of any other ancient record, that a dispersion of Mankind, consequent upon a phenomenal catastrophe, took place about 2233 B.C.; that the founder of his race, about whom, it may be conceded, the tradition was exact and accurate at the time it was put on permanent record, became an exile from his native land 1921 B.C.; and that the actual progenitors of his nation became settlers in Egypt 1728 B.C.

The earliest historical date, according to Lepsius, is that of *Manes*, the supposed founder of the unified Egyptian kingdoms—the first appearance of crystallization among the nomadic Semitic tribes—3892 B.C., or 112 years after the Creation according to Usher. Lepsius also dates the invasion of Egypt by the Shepherd Kings at about 2167 B.C.

On a tomb at Thebes—date 1500 B.C.—four negroes, true to their peculiar outline of form and features, and even of colour, are depicted.

The first historical appearance of the Semitic form of language in the Babylonian records is placed at about 2000 B.C.; and it has been conclusively shewn that when the Babylonian empire was fully established, inscribed edicts, &c., are set forth not only in the Semitic tongue proper to the empire, but also in Turanian duplicates for the information of the strangers among them.

The early legends and traditions of the Chinese point to an invasion, by their ancestors, of the country they now inhabit about 2000 B.C., when they found the land in possession of bands of barbarous nomads, destitute of the simplest arts of life, living without houses, feeding on insects and roots. These primitive people, relics of which are still to be found in the mountainous districts of China, were dispossessed, and their places taken by invaders from the N.W., who brought with them some of the arts of civilized life, but who have ever since retained their monosyllabic dialect, preserved their laws and customs, and maintained a character unchanged and unchangeable by the lapse of ages.

The Vendidad, Vedas, or Code of the Fire Worshippers of Iran, written in Sanskrit, contains what is said to be reminiscences of the passage of the old Aryans from the primeval land to India, along the upper branches of the Indus. It represents them as contending with native tribes of Turanian affinity—already settled there—whom they, in fourteen encounters, between the Caspian Sea and the Punjaub, successively vanquished, and enslaved or drove into the mountains, until, within the Historical period, they reached the Ganges.

In regard to the date of this invasion, everything is obscure. Bunsen supposes the Aryans reached the Indus 4000 to 3000 B.C. Duncker dates the composition of the Vedas at about 1800 to 1500 B.C. Sir W. Jones, from the list of Kings extracted from the Puranas, has traced the foundation of the Brahman rule to about the time of the Call of Abram, 1921 B.C. Colonel Tod has shewn that the Hindoos themselves establish the birthplace of their native land towards the West, and their entry into India at about 2256 B.C.—that is, about the time of the dispersion of Babel.

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At the dawn of History, then, three prominent families of nations appear. They are the Turanian, the Semitic (including the Egyptian), and the Aryan; and, at the date of the earliest historic monuments of human culture, each of these families is found presenting all those peculiarities of form, of feature, and of complexion which distinguishes them at the present day. We find, farther, that in the almost simultaneous movement of each of these great bodies of people, they came in contact with other, though inferior, nations, whom they found already in possession of the earth, and whom they dispossessed, and either exterminated or drove into corners.

LANGUAGE.

This appears to be one of the most accurate and important tests in the question before us. This is probably owing to the almost mathematical precision of its conditions.

The resemblances that are found to prevail among the languages of the earth are of two kinds:—*(a)* similarity of words, and *(b)* similarity of grammatical construction; and by comparison of several languages in these respects, a relationship is discovered between them which enables us to form them into groups or sub-families.

Though similarity of words is strongly indicative of the common origin of the language in which they occur, it has been a rule in comparative philology to determine the more intimate degrees of relationship principally, if not entirely, by *comparison of grammatical forms*, and to use the verbal coincidences as indications to be tested and confirmed by arguments from grammar. Verbal coincidences may be accidental or may arise from a process of "borrowing," but grammatical structure is too complicated to admit of its being adopted wholesale by any body of people not prepared for it by previous tendencies.

There are three categories of speech, under one or other of which all languages must fall:—the Radical, the Terminational, the Inflectional.

In the "Radical" class there is no formal difference between a *root* and a *word*. Each root preserves its own independence.

In the "Terminational," roots coalesce to form a word, of which roots one retains its Radical independence.

In the "Inflectional," roots coalesce so that neither one nor the other retains its substantive independence.

These three classes have also been styled respectively the *Family*, the *Nomad*, and the *State* languages.

To the Family or Radical class belong the dialects of China.

To the Nomad or Terminational class belong the languages of the Nomadic tribes of Asia, of the Aborigines of India and Malaysia, of the Negro, of the native races of America and Polynesia, and of the Basques, Finns, Lapps, Turks, and Magyars of Europe. A distinguishing characteristic of all these languages is "agglutination."

To the "State" or Inflectional (sometimes called the Aryan, Japhetic, Indo-European, or Iranian) belong most of the dialects of Europe, the

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Sanskrit, the Persian, the dialects of the Hindoos and their allies—Afghans, Beloochees, &c.—the Arabian, the ancient Chaldaic, Assyrian and Egyptian, the Hebrew, the Abyssinian, the language of the people of Northern and Eastern, and many others, of Central Africa, and notably, as a survival, the Lithuanian in Europe.

With nations as distinguished by language, certain peoples, related to each other, have the power of absorbing one another, until one language disappears; as, for instance, the Romans in Italy absorbed that of their Teuton invaders.

ETHNOLOGY.

The primary and most distinct varieties of the human race, according to Blumenthal, are the Caucasian or Iranian, the Mongol or Turanian, the Negro, the Malay and the American. These have been increased by Pritchard to seven; and, on the other hand, Cuvier has reduced them to *three*, viz.: the Caucasian, the Mongol, and the Negro.

They are found to differ from each other, not only in colour or complexion, but in physical organization and mental qualities. Of these differences that of colour or complexion may to a certain extent be regarded as accidental, though more emphasized and persistent among some people than others.

With regard to physical organization, the most remarkable distinctions that are found to prevail between different races present themselves in the skull and configuration of the bony fabric of the head, which give shape to the features and character to the countenance.

The Negro type finds its fullest development in Senegambia and Guinea.

The Mongolian or Turanian type prevails over a large part of Asia, throughout Malaysia, Polynesia, and America.

The Aryan form is found in Europe and the parts of America, &c., recently colonized by European peoples, in the Hindoo parts of Hindostan, Afghanistan, Baloochistan, Persia, Arabia, Egypt (among the Copts), Abyssinia, the Barbary States, in the Tibboos, the Hausas, the Fellahtahs, and several peoples on the East Coast of Africa.

Besides physical differences, there are moral distinctions between the races. One of the most obvious moral distinctions is that some portion of the human race is civilized, while another portion is wholly uncivilized, and between these two extremes there are many gradations of civilization.

Civilization is well known to be dependent upon the combined effects of external Nature and of Mind when brought into contact; and it is measured by the influence that each of them exercises upon the other. Where the laws of Nature strongly predominate and subordinate the laws of Mind, there Civilization is low and comparatively stationary. Where, on the other hand, the mental faculties are active, and when they triumph over the external world, there Civilization is highly progressive, and fruitful in results.

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None but the Caucasian race has shewn any capability for spontaneous and progressive development of civilization. The Negro has shewn no such capability. We find him a Negro in habits and disposition in the remotest ages—we find him a Negro still; and even when contact with the Caucasian has produced a beneficial and elevating effect upon him, we find relapse and retrogression take place as soon as he is left to himself.

The Chinese present us with the curious phenomenon of a people in a state of fossil civilization. It originates in an antiquity so remote that we vainly endeavour to discover its commencement. But that which it was in ages long past, it remains to this day; the life of the nation as well as of the individual is as a mill-horse round—continually in useful motion, but never advancing.

The Aryan alone is capable of spontaneous civilization, and of, by his influence, inducing and maintaining civilization in other races—at least, where those other races shew sufficient persistency of existence. The Aryans have at all times shewn themselves to be aggressive, the other races passive.

TO SUM UP.

The grounds for argument in favour of Unity of Origin are:—

(1) That, *à priori*, Man might be expected to vary.

(2) That Man presents no greater varieties than do animals known to be of one origin.

(3) That the members of a well-marked race of men differ among themselves as much as some of the various races differ from one another.

(4) That the phenomena of acclimatization and of "crossing" are in favour of the presumption of Unity.

(5) That under the principles of Inheritance and Variation, *with sufficient time* added, the present varieties of Man can be satisfactorily accounted for.

(6) That Man's state has been progressive, the original type being the savage of the Stone Age, upon which there have been local and congregational improvements in some sections of humanity, while other sections have permanently adhered to the original type.

(7) That Man's peculiar intellectual endowment, as distinguishing him from the beasts, while preventing any reversion in any individual or section—physically to the original type—tends to and does actually produce, morally, deviations in the way of debasement from the normal Savage standard. The Caucasian will never become a Negro in form and feature, but he may become, and has become, under certain conditions outwardly and inwardly a distortion downwards from the normal human type.

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The grounds for argument in favour of Diversity of Origin are :—

(a) That Unity of Origin connotes either Progression or Degradation from the Normal original type; and if Degradation, then a breach of the Law of Progress that is otherwise evident in Creation—not only in physical aspect and moral qualities, but also in lingual characteristics.

(b) That Distinction in Language corresponds to Distinction in Race.

(c) That physical aspect (except the accidental matter of colour), moral qualities, and lingual distinction are persistent, irrespective of geographical distribution of race, of duration of time, and numerical sufficiency.

(d) That physical and lingual distinctions of race have, as shewn by inscriptions, painting, and sculpture, existed from the earliest historic times.

(e) That in the earliest periods of History, philologists discover languages of complete and mature growth.

(f) That the geographical areas of races are and have been for ages broadly marked out.

(g) That when isolated bodies of people of one race are found existing in the geographical area belonging to another race, it is the result of *survival* in the inferior race, of *intrusion* in the superior.

(h) That the more highly intelligent races have always in their earliest settlements founded themselves preceded in occupation by inferior races, marked at least by lingual difference, whom they have expelled or subdued.

(i) That capability for spontaneous intellectual development depends and always has depended upon racial differences.

(k) That scientific evidence proves primeval man to have been a savage, correspondent to the savage of to-day, whom experience shews to be incapable of spontaneous advancement in any of the great racial characteristics.

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A BRIEF REVIEW OF THE FACTS CONCERNING *HYPOPUS.*

By F. R. Rowley, *Sub-Curator, Leicester Town Museum.*
(Read before Section "E.")

In tracing out the developmental histories of many of the lower forms of life, the student cannot fail to be struck with the remarkable series of changes which many of them pass through before attaining the final phase of their existence; changes which, in many instances, entail such complete transformations both in appearance, structure, and modes of life, that it would be easy to multiply instances in which observers have described as distinct species, forms, which subsequent investigations have demonstrated to be only the progressive stages of a single individual.

An interesting exemplification of this fact is furnished by the creature to whose life-history I have to invite your attention for a brief space this evening.

Though surrounded by much more favourable circumstances than those which are often presented for solution to the Biologist who devotes his energies to the elucidation of questions of this nature, a space of time represented by almost a century and a half elapsed between the discovery of *Hypopus* and the first approach to anything like an accurate interpretation of the seemingly contradictory character of the circumstances attending its transformations, as recorded by various observers.

Since then, however, more extended researches have been the means of largely increasing our stock of knowledge on the subject. It was with the view of acquainting those who might not be conversant either with the true position of *Hypopus* amongst the members of the family to which it belongs, or perhaps, even with its existence at all,—for it is certainly not generally known, owing no doubt to the limited number of workers in this particular field,—that the present paper was written. In the arrangement of the matter which it contains, I have had a two-fold aim in view: 1—to try and make clear to your minds what *Hypopus* is, and what it is not, and 2—to give in as short and concise a form as possible, an account of the leading features which have characterised the observations of those Zoologists whose names have been connected with the subject at various periods, from the year 1735 to the present day.

To begin with, *Hypopus* may be regarded as an inclusive term, embracing several forms of minute mites or Acari found not unfrequently attached to both Invertebrate and Vertebrate animals, though more particularly the former. Murray, in his work on the "Aptera," describes five (so-called) species, out of about twenty chronicled at various times,

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viz., *H. muscarum* (L), *H. alicola* (Duj.), *H. muscæ* (Tatem), *H. pulicis* (Tatem), *H. filicum* (Duj.), and *H. arvicola* (Duj.); the real value of these will appear later on.

The external appearance of a typical form is that of a somewhat oval minute Acarus (according to Michael, the average length is about ·25 millim.) having the body protected on the upper or dorsal surface by a stout cuirass of chitinous material.

Dujardin's figure of a form found by him in 1846 infesting *Musca stabulans*—and which is no doubt identical with the one described by De Geer in 1735, and subsequently invested by Linnæus in his "*Systema Naturæ*" with the title of *Acarus muscarum*—shows in a view of the ventral surface several points of interest. The limbs, which are eight in number, point more or less in a forward direction, and vary considerably in appearance. Thus, the first two pairs are very strong and robust, the third smaller in size and differently shaped, while the last are quite slender and filiform. I need hardly say that these distinctions are not necessarily constant, indeed Dujardin himself figures other forms which present considerable variations from the one under consideration. Perhaps the most anomalous portion of the animal is the head, with the very rudimentary mouth organs. These latter consist essentially of a straight lip or rostrum projecting outwards in the median line, cut square at the extremity, and apparently devoid of any perforation or channel of communication whereby nutriment might pass to the interior of the body. From its position and appearance it certainly gives one the idea that its function is of a suctorial nature, but observers are by no means in complete agreement on this point. A recent writer (A. Berlese), for instance, would credit it with being an organ of touch, denying also the existence of both oral and anal apertures.

To prevent any possibility of separation from its temporary host by accidental circumstances, *Hypopus* possesses a series of suckers placed at the posterior end of the abdomen, which serve to anchor their possessor firmly to the integument. It is worthy of note that, in a form found on a field mouse *(Arvicola)*, these suckers are replaced by an apparatus which grasps the hair in a pair of miniature pincers as it were, thus meeting the exigencies of a case in which the ordinary provision would have been of little service as a means of attachment.

Ordinarily, they (the *Hypopi*) are quiescent, but are capable of active movement if disturbed.

Paradoxical though the assertion may seem, *Hypopus* is not *Hypopus* at all, that is to say in so far as the word implies an animal entitled to be ranked in a genus of its own, as I shall presently show when narrating the most recent discoveries concerning it. It is true that it was at one time the generally received opinion that *Hypopi* were entitled to rank as distinct genera and species amongst the *Acaridæ*, but the evidence of later observers seems to conclusively prove the identity of *Hypopus* with other *Acari*, in the cycle of whose development it occupies a definite position.

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The history of the successive steps by which we have arrived at our present knowledge of the position to which *Hypopus* should be assigned, is one of no inconsiderable interest. I incidentally mentioned just now the name of the first discoverer, and the date of his discovery. From that date (1735) up to about the year 1868, we find the names of several well-known scientists associated with the subject, though their observations cannot be said to have produced any results of special interest. Following Linnæus comes Geoffroy, who appears to have noticed *Hypopus* on *Diptera*, as he speaks in his "*Histoire des Insectes*" of "brown fly mites," no doubt the same as those taken by De Geer from *Musca domestica*. Hermann, in 1757, also confirmed preceding observations, though it is worthy of note that he found them on other insects, viz., the larvæ of some Coleoptera. From the occurrence of spines upon the tarsi of these, he regarded them as a distinct species from *muscarum*, and gave them the name of *spinitarsus*. There seems, however, but little doubt that a very close affinity existed between his species and the ones previously described.

Twenty-four years later, another observer (Schrank) seems to have again come across a specimen, and in a different situation from any of those noted by his predecessors, viz., attached to a *Gamasus* (Gamasids are a family of yellowish mites which are commonly found parasitic on Coleoptera and Hymenoptera, and occasionally also on some Vertebrates). In allusion to the situation in which it was found, this form was dubbed Acarus of an Acarus (*Acarus acarorum*).

We now come to a gap of 53 years, in which no special notice seems to have been paid to the subject. Matters thus remained at a standstill until the year 1834, when Dugès, with the view of substituting more accurate and definite knowledge for the somewhat vague generalisations of the earlier writers, constituted his genus *Hypopus*. He had previously published an account of his discovery, on a *Hister*, of a mite which he regarded as being referable to Hermann's *Acarus spinitarsus*, and he now placed this, together with the original *A. muscarum*, in the new genus, the most prominent distinctive features of which are given in the following words:—"These *Acarids* have a narrow sucker, provided with two rigid bristles, directed outwards, and seeming to be composed of a lip soldered to the palpi." The result of his observations seems to have lead him to doubt the real value of the genus; for he hazards a conjecture whether the members of it might not turn out to be larval forms.

Within the next few years several new species were added to Dugès' genus. Dufour in 1839 contributed two,—*H. feroniarum* and *H. sapromyzarum*, the specific names having reference to their being taken from members of two genera of the Coleoptera and Diptera (*Feronia* and *Sapromyza*). M. Gervais also chronicled a new edition in 1844, and at the same time gave expression to the opinion that *Hypopus* and the neighbouring genus *Tyroglyphus* were intimately related, and this without any inkling of the true state of affairs as expounded by subsequent investigators. C. L. Koch in 1843 appears to have recognized the genus

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Hypopus, though previously he disregarded it altogether. Another observer, Dujardin, in the same year observed on a Bee a number of mites which he did not recognise as *Hypopi* at the time, but for which he formed a new genus, *Anœtus* (from ἀνοητος—incomprehensible). This he afterwards did away with and classed them as *Hypopi*, seeing their true affinities. Dujardin may be said to be the first who really made anything like a thorough study of the subject. During the course of about three years he collected great numbers of *Hypopi* from various situations, and made them the subject of special study, thereby revealing several peculiar facts, upon which he based a theory—generally accepted as correct for a number of years, but eventually overthrown and superseded—that *Hypopus* was an immature form of other *Acari*: to wit, the *Gamasi*. The reasons which led him to come to this conclusion were these:—Some of the specimens under observation were distinctly seen to contain in their interiors other mites in process of development, and these contained forms presented to the eye of Dujardin all the characteristics of Gamasids; hence he naturally concluded that the *Hypopi* which contained them, represented a prior stage in their development.

But *Hypopus* was not long permitted to remain undisturbed under the shelter of Dujardin's hypothesis, and the next to take the field was practically the herald of the final settlement of affairs. In 1868 a celebrated French scientist, M. Claparède, while working at this subject, had under observation a number of *Acari* of the genus *Tyroglyphus*, which includes our common cheese mite, and the *T. entomophagus* so destructive in insect cabinets. His specimens were found in great numbers on decaying vegetable substances, and, on passing them in review, he was much struck by the fact that, without exception, only females were present—not one male could be found. At the same time he noticed, associated with these females, a great number of *Hypopi*, all similar in size, and shewing no traces of sexual distinction. Here, thought Claparède, is a capital opportunity to demonstrate the truth of Dujardin's theory, according to which my cages should in a short time be filled with Gamasids. But, alas! for the fallibility of human judgment—not a single Gamasid put in an appearance, although their supposed prior stages were present in thousands; and thus a somewhat difficult problem was presented for solution, viz.: Where had these *Hypopi* come from, and what was the real meaning of their presence in such numbers?

Close scrutiny failed to elicit any answer from the *Hypopi* themselves, and in the hope of throwing some light on the subject, Claparède determined to follow carefully the changes of the female *Tyroglyphi*. This he accordingly did, and followed them from the egg upwards through two or three successive stages. Much to his astonishment, he observed *Hypopi* proceed in many instances from the second larval form of *Tyroglyphus*. In this it is easy to see a modification of Dujardin's observations; but Claparède had already completely upset that hypothesis, for he had proved to demonstration that *Hypopus* had nothing whatever to do with *Gamasus*, and now he was confronted by a fresh array of facts

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requiring explanation. He argued thus:—Here are *Hypopi* and *Tyroglyphi* found together in great numbers. I can find no traces of sexual distinction among the *Hypopi*, and I can only discover female *Tyroglyphi*. In addition to this, I have found *Hypopus* apparently forming part of the cycle of development of *Tyroglyphus*. Therefore, taking all things into consideration, I conclude that in *Hypopus* we have the male of *Tyroglyphus*.

This explanation seemed at first sight a very plausible one, but, unfortunately for the theory, some other observers who had been engaged in similar researches had been more successful in finding both males and females of *Tyroglyphus*, and so a full explanation was still a desideratum.

It was about 1873 that M. Mégnin first gave publicity to some very curious incidents observed by him during a protracted series of investigations, and in this case also a *Tyroglyphus* was the form from which the inferences were drawn and the deductions made. He had in his laboratory a number of the last-mentioned *Acarus*—a feeder on mushrooms, and thriving well in his cages on that diet. It was noticed that as long as the mushrooms remained moist and soft, everything went on in due order—the *Tyroglyphi* abounded, and generation succeeded generation in the most orthodox manner; but no sooner did their pabulum begin to dry up, than a strange change in the aspect of affairs took place. The *Tyroglyphi* disappeared almost entirely, and in their place, behold!—multitudes of *Hypopi*. Supply fresh food, and the whole process is reversed: the *Hypopi* vanish, and again *Tyroglyphus* takes the field. Time after time, with unfailing regularity, was this curious transformation reproduced. It was obviously necessary that more extended observations should be made in order to furnish a key to the mystery. Accordingly, as the result of further investigations, it was announced that *Hypopus* had been detected in the act of moulting, and that the resultant form was an immature form of *Tyroglyphus*. Having regard to these circumstances, Mégnin, in the published account of his elaborate researches into the true meaning of these phenomena, was led to combat the idea of *Hypopus* being a distinct form. On the contrary, he expressed his opinion that it must be looked upon merely as a stage in the development of *Tyroglyphus*—that it was in fact a form charged with the preservation of the species under circumstances which would be fatal to them in their ordinary condition.

Not content with this, Mégnin pushed his researches further, and in 1879 and 1880 published other papers, in which he does not confine the occurrence of a hypopial stage to *Tyroglyphus rostro-serratus* and *T. mycophagus*—the species which had been the subjects of his previous experiments—but states that the same thing occurs in other *Acari*. Amongst those which he mentions is our common cheese mite, the hypopial nymph of which, we are informed, is the "species" described by Hermann, more than a century before, as *Acarus spinitarsus*.

Very soon after the first series of observations just detailed—viz.: in 1877—an entirely novel view respecting *Hypopus* was brought forward

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by Mr. Andrew Murray. After reviewing the various facts concerning it he offered the suggestion that *Hypopus* was an animal, part of whose existence was passed as an internal parasite in other creatures, and supported his view in a lengthy argument.

After referring to M. Mégnin's mention of the finding of two *Hypopi* adhering to a *Gamasus* in such a manner as to convey the impression, when microscopically examined, that they were really contained in its interior, thus leading him to imagine that a confirmation of Dujardin's view was about to take place under his very eyes,—a thing, however, which never took place, for Mégnin afterwards confessed that the appearance was doubtless due to an illusion,—Murray suggests that they may really have been present in the interior of the *Gamasus* after all, in the capacity of internal parasites. He further goes on to cite instances of the occurrence of *Hypopus* in situations which, to his mind, would seriously militate against their forming part of the developmental history of any particular form or forms.

Thus, in the "Monthly Microscopical Journal" for 1872, Mr. Tatem records the finding of a mite—named by him *Acarellus musce*, but afterwards proved to be a *Hypopus*,—which he affirms was taken from the abdominal cavity of a dead flea. "*Qu'allait-il faire dans cette galère*, if it was a phase of a vegetable-feeding *Tyroglyphus*," says Murray, but a little consideration will, I think, enable us to partially meet the objection. In the twenty-second "Report of the Quekett Microscopical Club" is printed an address on "Parasitism," from the pen of the then President, Mr. A. D. Michael, F.L.S., in which this paragraph occurs:—"In the collection of this Society will be found a slide of a large flea with numerous *Hypopi*, which were supposed to be inside it. A careful examination will show that this is an error, and that the *Hypopi* are only between two segments of the abdomen, being in the part where the anterior edge of a segment is drawn within the posterior edge of the previous segment in a telescopic manner, thus providing a place of shelter for the *Acarus*." I do not know whether there is any history attached to the specimen, but is it not possible that this was the true explanation of Mr. Tatem's case?

Murray also calls attention to the finding of a *Hypopus* by Dr. Maddox in 1871, associated with the larvæ of a parasitic tick in the ear of a bat. He seems to regard its presence as indicative of its being there for the purpose of preying upon the ticks by which it was surrounded, but the explanation seems to me unnecessarily elaborate if we adopt instead the view of Haller and Michael, which would make the hypopial form a "travelling dress" for the dissemination of the species of whose life-history it formed a part. But of this more anon.

The writer whose views we are now discussing, after reviewing Mégnin's work, suggested that the true explanation might be looked for in the parasitism of *Hypopus* upon *Tyroglyphus*. Agreeably to this theory he contended that the reiterated changes from *Tyroglyphus* into *Hypopus*, and *vice versâ*, could be easily explained. On the death

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of the former, through the drying up of its nutriment—the mushrooms—the latter, acting upon the impulses common to most parasites, who leave their hosts as soon as death takes place, would break out of their hiding-places, thereby causing the troop of *Hypopi* seen, and would in turn die also. The fresh supply of mushrooms might easily cause the appearance of fresh swarms of *Tyroglyphus*, either through the medium of some yet living, or by the introduction of eggs with the mushrooms, as it would be readily conceivable that such minute objects as the eggs of an *Acarus* might, notwithstanding the most elaborate precautions, be introduced into the cages.

It is, however, only fair to say, in justice to Murray, that he fully admitted the inadequacy of his theory to explain many points of doubtful significance in connection with the subject.

It now remains to treat of some later researches of very great interest. A short time back, Mr. A. D. Michael, F.L.S., F.R.M.S., favoured me with a reprint of a paper read by him before the Linnæan Society, on the 17th January, 1884, in which, after reviewing the observations of previous writers, he gives an exhaustive account of a series of experiments instituted by him, which materially lessen the difficulties of the situation.

After watching specimens of *Tyroglyphus siro* and *T. longior* for some time, with indifferent success, Mr. Michael started a colony of *T. mycophagus*, and readily substantiated Mégnin's assertions as to the occurrence of the hypopial stage. On some other points, however, perfect agreement was not arrived at. It will be remembered that the result of Mégnin's observations tended to show that swarms of *Hypopi* appeared in his cages as a necessary sequel to the drying up of the food contained therein. Now this was not the case with Mr. Michael, who, on gradually allowing the fungus in his cells to get dry (without replacing it), found no perceptible increase in the number of *Hypopi*, though the *Tyroglyphi* rapidly diminished under the influence of the increasing drought; and a number of trials uniformly gave these results.

It must be borne in mind that Mégnin's theory as to the true nature of *Hypopus* being that of a "cuirassed adventitious heteromorph," charged with the presevation of the species under unfavourable circumstances, depended largely for its accuracy upon the special feature of his observations above detailed. If that were controverted, it would practically remove the keystone from the arch of his argument.

Another thing, I think, that would strike anyone following Mons. Mégnin's train of reasoning, would be that *Hypopi* would, or should, only occur numerously where surrounding circumstances were inimical to the normal existence of *Tyroglyphus*. Again Mr. Michael's observations ran counter to the conclusion. In his paper he mentions finding *Hypopi* in great profusion amongst moist decaying vegetation in a chaff-house, under the most favourable conditions possible for the healthy existence of *Tyroglyphi*, which was abundantly evidenced by the numbers of the last-named forms which were found.

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With the *Tyroglyphi* obtained from the source I have just mentioned, Mr. Michael applied the test of placing specimens in cells exposed to different hygrometric conditions, and found that *Hypopi* predominated in the ones placed under favourable conditions rather than in those which were gradually allowed to dry, thus confirming his previous observations. It was noticed that as the moisture gradually evaporated, the *Tyroglyphi* would retire into any available cracks and crannies that might serve to shelter them from the impending drought; and yet they would obstinately refuse to adopt what, according to Mégnin, was Nature's provision for them in such a dilemma, viz.: the change into the hypopial condition.

Special attention being paid to the transformations of *Tyroglyphus*, several noteworthy facts were brought to light. In the forms studied by Mr. Michael, *Hypopus* was observed to occupy a definite position in the cycle of development, and that the time of its appearance corresponded with the second nymphal ecdysis—that is to say, that ecdysis would produce a *Hypopus*, which, at the next ecdysis, would revert again to a Tyroglyph. Another point demonstrated is that all *Tyroglyphi* do not pass through a hypopial stage; numbers of them pass from birth to maturity without any deviation from the ordinary routine of their existence; so that it is evidently not a universal rule for this special form to make its appearance. Neither was the peculiarity found to be confined to any particular sex, both males and females exhibiting it in about equal proportions, though the balance might be said to be a little in favour of the females.

In addition to his experiments on *T. mycophagus*, &c., Mr. Michael took in hand the investigation of the true nature of a curious parasite found upon Gamasids taken from Bees, the record of the finding of which by Mr. C. F. George will be found at p. 81, vol. xv., of "Science Gossip," where it is there supposed to be a *Hypopus*, and to be parasitic upon the Gamasids alone. This view was, however, shewn to be a fallacy, on the strength of evidence obtained by carefully watching a number of specimens under varying circumstances. It was speedily found that their existence was maintained very well without any host at all, either Bee or *Gamasus*, though it was at first difficult to tell in what light they should be looked upon, seeing that they refused to pass through any transformations whatever, living and dying with persistent obstinacy under the one form. This certainly seemed a very strange procedure, and quite at variance with the preconceived notions of the meaning of the hypopial condition, according to which, specimens of *Tyroglyphi* or some allied form should have been found in the cells as the outcome of an ecdysis on the part of the so-called "*Hypopi*."

Before long, matters came to a quite unlooked-for termination. In one of his cells Mr. Michael had placed some *Gamasi* and "*Hypopi*," the former of which he was accustomed to feed with cheese mites. It being a rather tedious process to supply these singly, a fragment of cheese was placed in the cell for them to breed in. Having occasion to

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examine this cell not long afterwards, the "*Hypopi*" were seen to have transferred their attentions from the Gamasids to the cheese, about which they were assembled in clusters. A closer inspection revealed the fact that *eggs* had been laid on the cheese, apparently by the "*Hypopi*," who thus put in a claim to be regarded as adult forms. The eggs were carefully removed and isolated, until they hatched. When this took place, Mr. Michael was surprised to note the emergence of curious hexapod larvæ, new to him, which grew rapidly, and by the ordinary method of ecdysis gave rise, not to a nymph, which is the general rule, but to two dissimilar forms, some of which were precisely similar to the original "*Hypopi*," while others presented totally distinct features. (Excellent figures of all the forms will be found in a plate at the end of Mr. Michael's paper.) As the result of further investigation it was proved that the so-called "*Hypopi*" were really adult females, and the other forms produced from the larval ecdysis adult males; and also that of these three forms (larva, male, and female), the latter was the only one which had been observed upon the Bee or *Gamasus*. In discussing the question, Mr. Michael forms a distinct genus for their reception, which he calls *Disparipes*, giving the specific title *bombi* to this particular form.

It seems to me that the explanation offered by this observer as to the true position of *Hypopus* is the only one which meets most fully all the circumstances of the case. As regards true *Hypopi*, while agreeing with Mégnin as to their being "heteromorphous nymphs of *Tyroglyphus* and some allied genera," he is not disposed to look upon them as a *special* stage in a life-history provided with a view to secure the perpetuation of the species under adverse circumstances, but rather as an *ordinary* provision of Nature for securing the dissemination of the species, the hypopial stage being in fact a "travelling dress," under cover of which it attaches itself indiscriminately to various creatures who are thus instrumental in distributing it over a wide area.

It is obvious that, as Michael says, "being carried by such creatures as bees, flies, &c., which delight in hot sunshine—a thing which kills most *Acari*—the hypopial condition, which enables this creature to endure greater heat and absence of moisture than the ordinary *Tyroglyphus*-form can survive, must be of advantage to it." In addition to these conclusions, it is patent to any one following the life-history of *Disparipes* that —to again quote Mr. Michael's words—"the protective dress may be given either to immature or adult creatures." In this case, it will be remembered, it seems to be exclusively assumed by the females.

Such are, I think, the chief facts bearing upon the various aspects of the question—briefly sketched, it is true—and from the consideration of which I must leave you to draw your own conclusions. For the benefit of those who may be desirous of making themselves more fully acquainted with the literature of the subject, I append a bibliography of the chief works relating thereto. In the compilation of this I am indebted to the very complete list given by Mr. Michael in his paper above quoted.

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THE FERNS OF LEICESTERSHIRE.

By F. T. Mott. (Read before Section "D," *February 20th*, 1889.)

In the "Synopsis Filicum," by Hooker and Baker, published in 1874, 2225 species of known Ferns are described. An immense majority of these are natives of tropical and subtropical regions. North America contains about 150 native species, Europe about 60, the British Isles 45, and Leicestershire 21. In the neighbouring Midland Counties of Warwickshire and Oxfordshire the number is about the same as in Leicestershire. On our dry flat eastern coasts the species are fewer, and in the moister and more mountainous districts to the west and south they are more numerous. The known genera of Ferns are given as 75, of which 11 are represented in this County; and of the six sub-orders we have representatives of three. The relative proportions are thus:—

Of species,	Leicestershire	has	1	in	100
Of genera,	„	„	1	„	7
Of sub-orders,	„	„	1	„	2

which corresponds with the biological law that the more inclusive the type, the more general is its distribution. The three primary divisions of the vegetable world, the Dicotyledones, Monocotyledones, and Acotyledones are probably represented in every local Flora throughout the globe.

Although the great majority of known Ferns delight in warmth, moisture and shade, some are hardy enough to flourish even in Arctic regions, and a few prefer dry rocks exposed to sun and wind. About half of our Leicestershire species are among the hardiest of their kind. *Pteris aquilina*, *Lomaria spicant*, *Asplenium Ruta-Muraria*, *A. filix-femina*, *Cystopteris fragilis*, *Nephrodium spinulosum* and *Botrychium lunaria* may all be found along the northern shores of Europe, Asia and America; while *Asplenium Trichomanes*, *A. Ruta-Muraria* and *Cystopteris fragilis* seem to choose the dryness and exposure of bare rocks, mountain summits, and crumbling walls.

The species which seems to be most limited in its distribution is *Nephrodium oreopteris*, the sweet-scented Mountain Fern, which is confined to Europe and the western edge of Asia, and even in Europe it has not yet been recorded from Sweden. This graceful and interesting Fern is exceedingly common in Scotland. In the glen of the Trossachs its pale green plumes are everywhere, but in this County it is almost confined to a few shady spots on Charnwood Forest. I shall not indicate these localities. The general British public are not yet sufficiently trustworthy to be informed of the secret recesses in which Nature hides

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her treasures. Some years ago, I was thoughtless enough to publish one of these localities, and in a few months every fragment of the plant was gone. What selfish barbarian it was who thus robbed his neighbours, I have never discovered, but I hope the ghost of a Fern-Owl may haunt him till his soul grows kindlier.

Of the 21 species recorded for this County, three at least must be regarded as extinct, viz., *Asplenium viride*, *Nephrodium thelypteris*, and *Osmunda regalis*.

A. viride was once recorded by Pulteney, a hundred years ago, from the crags of Beacon Hill, and *N. Thelypteris* by Crabbe, from a bog near Belvoir. They have never been seen or heard of since. *Osmunda*, the beautiful "Flowering Fern," grew in several places about the borders of the Forest in Pulteney's time, and in one spot near Sapcote, in the Hinckley district, until about 40 years ago, but no trace of it is now to be found.

Four other species are fast disappearing, and some of them may perhaps be already extinct. These are *Asplenium Trichomanes*, *A. Adiantum-nigrum*, *Cystopteris fragilis*, and *Aspidium angulare*.

The only Ferns which are really common in the county are the Brake, the Lady Fern, the Male and the Broad Ferns.

The Brake is found in all parts of the County, wherever there is an old wood, or a bit of old common land. The Lady-fern, Male-fern, and Broad-fern are found everywhere on the sides of ditches and shaded streams, in hedge bottoms, copses, gorses and spinneys. The Syston district is the most barren in Ferns. The Lady-fern has never been recorded in that neighbourhood, and all the others are scarce there. It includes the valley of the Wreake and is mostly stiff clay soil.

The Polypody and the Adder's-tongue are found in nearly all of the 12 botanical districts of the County, but they are only abundant in certain limited localities, not spread abroad like the more common forms. The Polypody is very plentiful in the hedges about Battleflat, and the Adder's-tongue about Glenfield, Rothley, and Woodhouse Eaves, besides many other places.

The Prickly Shield Fern *(Aspidium aculeatum)* is nowhere common, though it is recorded for seven districts. The Lobed Shield Fern *(A. lobatum)* is rather rare. It grows in similar situations and is often found actually mixed with the Prickly Shield Fern. I remember, many years ago, gathering the two so close together that I doubted whether the rigid *lobatum* was not the young frond, and the softer *aculeatum* the mature frond, from the same root-crown.

The true Soft Shield Fern *(A. angulare)* with the pinnules distinctly stalked, is the rarest of the three forms. I have never found it in the County. Coleman records it in several places on his own authority. It is plentiful in many parts of England, especially in the south and west, and is found both in Warwickshire and Oxfordshire; so that it is not unlikely to turn up in odd corners of this County, here and there.

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The Harts-tongue is a rather rare Fern with us, yet it is recorded in 10 of our districts. It is nowhere plentiful in the County, and the specimens found are often small and apparently stunted.

Cystopteris fragilis I have never gathered myself in Leicestershire, but a specimen was brought to me some years ago which was said to have been found in a hedge in Long Lane, near Coalville, and I have recently been informed of a locality in district five where it is growing on an old wall.

Nephrodium spinulosum is not very uncommon, though much less abundant than *N. dilatatum*. It may be found in Buddon, Swithland, and Bensciff Woods pretty plentifully, and often intermixed with *dilatatum*. The true *spinulosum* has the fronds narrower, softer in texture, and of a paler green, with the scales at the bottom of the stripe of a uniform pale fawn colour, without the dark central stripe which marks the scales of *dilatatum*.

Botrychium Lunaria, the pretty and interesting Moonwort is one of our rarest Ferns. Pulteney recorded it between Okeley Wood and Long Whatton, Bloxam near Twycross, and there was a meadow near Humberstone in which it grew for several years, but from which it has long disappeared. It had never been seen on Charnwood Forest until the summer of 1879, when the Midland Union of Natural History Societies met at Leicester and took an excursion over Charnwood Forest. As we were descending one of the bare hill-sides along a broad green path in which the grass was kept constantly short by the nibbling of rabbits, we observed before us, in the very middle of the path, an odd-looking plant about two inches high, which proved to be *Botrychium Lunaria!* On reaching the bottom of the hill we passed through a field or two and into a small meadow, where the grass was four or five inches long. Here, by the side of the narrow track and in the long grass, were several more specimens of the Moonwort! and in this meadow it was still growing four years later. It was a very odd discovery, because the path is a well-known one on the Forest. I had been along it certainly half-a-dozen times before and never seen a single plant of Moonwort, yet on that day there it was in two localities perfectly conspicuous.

An interesting subject for investigation is afforded by the extraordinary variation in the fronds of some Ferns. The Male, the Lady, the Harts-tongue, and the Polypody are especially remarkable for this tendency. The conditions of life in this County do not seem to favour the tendency, for the variations recorded are exceedingly few. The purple-stalked Lady Fern is not uncommon, and the Harts-tongue has been found with bifid and trifid fronds. I have a number of specimens of the Male Fern in my Herbarium which vary slightly in the forms and arrangements of the pinnules, and one in which the indusiæ on the back of the frond are of a bluish grey colour; but the singular, crested, curled, forked, and crossed varieties, which are found in other parts of Great Britain, do not occur in Leicestershire. Mr. E. J. Lowe, formerly of Beeston, near Nottingham, and now of Shirenewton, near Chepstow, has

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devoted himself to the cultivation and study of these varieties, and has many hundreds of them in his grounds. He has also succeeded in obtaining hybrids by artificial crossing. A paper prepared by himself and a friend on this subject was read at the Bath Meeting of the British Association.

A complete history of Ferns would include the whole geological history of the earth from the Devonian epoch to the present day. The earliest terrestrial fossil plants yet discovered were Ferns. In Carboniferous times, some of the leading fern-types were nearly allied to existing genera. It is difficult to estimate the possible longevity of a single individual Fern with a creeping rhizome. The Common Brake *(Pteris aquilina)* has such a rhizome, and as this continues to grow at one end and to wither at the other, there seems to be no necessary termination to its life. The very same Fern roots which now cover our Charnwood Hills may have been growing there for a hundred thousand years, or at least since the hills were left bare by the receding glaciers.

Seedling plants are scarce notwithstanding the quite inexpressible number of spores which are produced annually. These spores, and the spore-cases in which they are contained must contribute largely to the accumulation of soil which clothes the hillsides, and it would be interesting to examine some of this soil microscopically to ascertain whether they could be detected in it as they have been in sections of coal.

Seedlings of our other common Ferns are abundant enough, and are often mistaken by young botanists for some unknown species, the fronds being always much less divided and of more delicate substance than when mature, but it is rare to find a seedling of the Brake, although this is the commonest of all our local species. This peculiarity is not satisfactorily explained, and would repay investigation.

In proportion to their size and their abundance, Ferns are among the most useless of all plants to man at the present day. Beautiful in form, though monotonous in colour, they are good for decorative purposes while living, and are turned to account as litter when dried, but they afford no important material for food or for any of the industrial arts, and as far as man's utilitarian wants are concerned he could do very well without them.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Tuesday, March 19, 1889.—Mr. G. B. FRANKLIN read a most interesting and scholarly *Paper* on "Florence."

A discussion followed, in the course of which Mr. JOSEPH HARVEY described his impressions of Florence, derived from a recent visit. The hearty thanks of the Section were given to Mr. FRANKLIN.

At the close of the Meeting it was moved by Mr. WILLIAM SIMPSON, seconded by Mr. J. D. PAUL, and carried unanimously, "That Mr. THOMAS CARTER, LL.B., be elected Chairman of the Section for the ensuing Session."

Mr. JOHN SCAMPTON was re-elected Secretary.

A. H. PAGET, *Chairman.*

SECTION "C."

FOR GEOLOGY.

May 16, 1889.—This Meeting of the Section was called for the purpose of considering the future of the Section, but only four members were present.

After a long discussion, no arrangements were come to for carrying on the Section, no officers were elected, and the Secretary was desired to report the result to the Secretary of the Society. See Annual Report.

C. A. MOORE, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

March 20, 1889.—*Exhibits.* By Mr. W. A. VICE. Specimens of the curious and interesting fungus *(Craterium leucocephalum)* on a dead leaf of holly. This species had not hitherto been recorded for the county.

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By the CHAIRMAN, Eggs of the Common House Fly; of *Polymmatus corydon*, a butterfly found in chalk districts; and of a parasite on the feathers of the Stanley Crane, which were examined with the Society's binocular microscope.

Discussion, on "The Causes of the Varied Colours of Skin and Hair in different Races of Mankind." The discussion was introduced by the CHAIRMAN, who pointed out that the various races might be roughly classified, with reference to colour, as white, yellow, red, and black, though there were many mixtures and intermediates. The lowest races were all very dark, as the Australians, Fuegians, Bushmen, Anderman Islanders, Negroes, &c. The American Indians, who were a grade higher in capacity, were less dark. The Mongolians, who had a partial civilization, were yellow, while those who stood highest in the scale of humanity, as the Greeks, Romans, Teutons, and Scandinavians, were fair. The colouring matter was always found in a peculiar tissue called the *rete malpighii*, which lay between the *cutis* or true skin, and the *epidermis* or outer skin.

In the discussion of this subject many questions would require to be answered, the following among others, viz. :—

1. Is difference of colour due to climate?
2. Is it due to rank in the scale of development?
3. Is it due to natural selection?
4. Is colour protective in man, as it seems to be sometimes in animals?
5. Can any analogy be shown between the colours of man and those of brutes?
6. Are animals mostly dark-skinned or dark-furred in hot climates or among effete orders?

An interesting conversation ensued, and the SECRETARY promised a *Paper* on the subject at a future meeting.

April 17, 1889.—*Exhibits.* By Mr. W. A. VICE. Clusters of the microscopic fungus *(Puccinia lapsanæ)* from Blaby; a new county record.

By Mr. CARTER, fine specimen of *Orobanche elatior*, with its root attached to the root of *Centauria scabiosa*, on which it is parasitic.

By Miss NOBLE, fresh flowers of several interesting species, from Cannes.

By the CHAIRMAN, fresh flowers of several bulbous plants, squills, daffodils, hyacinths, &c., and a large number of dried specimens of various bulbous genera.

By Mr. E. F. COOPER, F.L.S., dried specimens of bulbous plants.

Paper, by the CHAIRMAN, on "The Native Bulbs of Leicestershire,' in which he described the differences between the bulb, the corm, and

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the tuber, and said that the bulb occurred only in the orders Amaryllideæ, Irideæ, and Liliaceæ. The Leicestershire Flora contained only ten bulbous species, viz., two Amaryllids and eight Liliads, and of these only one Amaryllid and three Liliads were really natives, viz., the Daffodil, the Wild Hyacinth, the Bear's Garlic, and the Crow Garlic. Seeing that there were at least 200 bulbous plants indigenous to Europe, it was a little remarkable that so few had found their way to Britain.

Mr. COOPER, F.L.S., suggested that the failure of many otherwise hardy plants to acclimatize themselves in Britain might be owing to the dampness of our atmosphere in the early months of the year.

May 15, 1889.—*Exhibits.* By the HON. SECRETARY, a fine live Blind Worm (*Anguis fragilis*).

By MISS NOBLE, frond of *Aspidium lobatum* from Charnwood Forest; fruit of *Pistacia lentiscus*.

By Mr. W. A. VICE, the Pod of a Pea much cultivated in Spain, very short, and containing only one seed, and several species of microscopic fungi.

By Mr STORER, a collection of curious and rare British eggs, including some spotted eggs of the common fowl, and eggs of the Little Grebe from Thornton.

By Mr. PALMER, an interesting collection of eggs, including those of the Kestrel and the Magpie, both taken in the county.

By MISS GRUNDY, a collection of Leicestershire eggs.

Paper by the Hon. Secretary, Mr. J. J. W. KNOWLES, on "The Theories as to the Variations of Race in Mankind," in which the author marshalled the evidence for and against the two rival theories of "unity of origin" and "diversity of origin" under the five heads of Geology, Archæology, History, Language, and Ethnology, but refrained from expressing any decided opinion of his own.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY.

March 11*th.*—A *Paper* was read by Mr. H. E. QUILTER upon "The Shell and Periostracum of the Mollusca."

In his opening remarks he alluded to the present want of knowledge as to the relationship, from an evolutionary point of view, of the external covering of the Mollusca to the animals themselves, stating that his Paper would deal mainly with those questions, in the hope of throwing some light upon them.

Dealing in the first place with the structure of a typical molluscous shell, the existence of nacreous, prismatic, and epidermic layers was

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demonstrated, together with their several relations to the mantle of the animal. In speaking on the subject of shell growth, attention was called to two theories respecting the real origin of the prismatic layer, one of which would credit its formation as due to a rearrangement of the particles of lime, of which it is composed, into a crystalline condition; the other regarding it as a process of growth by intussusception.

After touching upon the chief points in connection with the chemical composition of shells in general, Mr. QUILTER proceeded to describe the developmental history of the Mollusca, giving first a brief sketch of the leading features of the processes involved, afterwards filling up the picture by means of more detailed descriptions of the development of the members of various orders and genera. The nature of the evidence yielded by embryological research would seem to point to the Mollusca having become differentiated from a worm-like ancestor, seeing that the embryos of some *Chætopoda* differ from them only in the non-possession of a foot and shell-gland.

In passing on to speak of the later development of the molluscan larva, it was pointed out how various disturbing causes, of the true nature of which we were probably unaware, were answerable for many variations and modifications of the original plan. In illustration it was shewn how some larvæ are provided with embryonic shells, in contradistinction to others who lack this provision, and how in some instances a secondary shell is found to be developed during larval life.

In seeking for an explanation of the true meaning which should be attached to the occurrence of a shell in the Mollusca, it was pointed out first of all that embryology proves the first material formed by the shell-gland to be of a chitinous nature. Arguing from this premise, Mr. QUILTER stated that his opinion would lead him to regard the periostracum of the shell as being identical with the original chitinous covering, the remaining layers having been formed by the deposition of lime salts, which might have been taken in by the animal with its food, and, being in excess of the powers of its excretory organs to dispose of, a portion circulating through the system of the animal would eventually become secreted on the internal surface of the chitinous investment, in primary instances probably taking the form of a deposition of simple crystals of carbonate of lime as in some Tunicates; the true shell being thus in the first instance merely an excretory product, which would eventually be utilised by the animal as an additional protective covering, and "handed down with cumulative developments and adaptations to the present time."

In conclusion, the non-existence of molluscan remains in strata prior to the Cambrian Period was noted, and as observations would point to the probability of their antiquity being much greater, it was suggested that an explanation for this circumstance might possibly be found if it was supposed that the pre-existing forms were devoid of a shell capable of preservation during any lengthened period.

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In the discussion which followed, the CHAIRMAN referred to the Paper as evincing a considerable amount of research; he expressed his interest in the theories advocated, especially the one which would regard the carbonate of lime as an excretion of the animal unable to escape because of the periostracum.

Exhibits.—Various shells, by Mr. H. E. QUILTER. Specimens of *Phigalia pilosaria*, *Biston hirtaria*, *Chelonia plantaginis*, *C. villica*, and *Liparis dispar*, by Mr. F. BOUSKELL.

April 8th.—A *Paper* by Mr. W. A. VICE, M.B., on "The *Halteres* of the Diptera, their Structure and Function," was read in his absence by the SECRETARY.

Speaking in the first place of the position of the *Halteres* as appendages of the metathorax, their form was next described as being a kind of curved battledore shape, having a rounded extremity, and connected with the body by a slender stem, a high power of the microscope revealing the presence of numerous hairs upon the knob-like termination, and a somewhat striking arrangement of parts at the base of the stem.

In passing on to treat of the evidence which is forthcoming as to the true functions of these organs, Mr. VICE shewed how Keller and Hicks were amongst the first to describe their peculiarities, the latter observer demonstrating their possession of a large nerve branch, principally devoted the supply of a number of vesicle-like bodies placed at the bases of the *Halteres*.

These vesicles, which were found to vary considerably in arrangement in various species, were stated by Bolles Lee to be perforated, and to contain a minute hair. This structure was compared with the auditory apparatus found in the Orthoptera, and attention called to the great similarity existing between the two. Lubbock's observations anent the presence of similar arrangements of cells and auditory rods in ants and other insects were also quoted, the combined evidence seeming pretty conclusive as to their being organs of hearing. In his closing remarks, Mr. VICE suggested whether we might not "consider them as specially modified in the Diptera for that purpose, whereas in other orders they serve the purpose of flight, and to a more or less degree the functions of the *Halteres*."

After some remarks by the CHAIRMAN, a vote of thanks was accorded to Mr. VICE for his Paper, and the CHAIRMAN also moved a resolution, which was seconded and carried unanimously, to the effect that the Council of the Society be approached with a view to ascertain their willingness to assist the work of the Section by a grant of money, to be expended in the purchase of Biological works.

Exhibits.—Sketches and microscopical preparations of the *Halteres* of various species of Diptera, including *Eristalis tenax*, *Leucozona leucorum*, *Leptis scolopacea*, *Empis livida*, *Tipula oleracea*, and *Bibio*, by Mr. W. A. VICE, and the SECRETARY.

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May 6.—The first business before the Meeting being the election of officers for the ensuing year, a letter was read by the SECRETARY from Mr. MONTAGU BROWNE proposing the re-election of Dr. POPE as Chairman; Mr. W. A. VICE seconded the proposition, which was carried unanimously.

Dr. POPE, after expressing his willingness to accede to the request of the members that he should occupy the chair for another year, proposed the re-election of the present SECRETARY; this proposition, which was seconded by Mr. F. F. HOW, was also carried *nem. con.*

The SECRETARY, having suitably acknowledged the compliment, presented the Annual Report and Balance Sheet for the approval of the members. These, which showed a substantial increase in the number of members during the year, and also a satisfactory financial position, were passed by the meeting, and an excursion to Bardon Hill was then arranged for Saturday, May 18th.

Mr. H. E. QUILTER brought forward a first instalment of a list of the Coleoptera of the county, which it is proposed to publish in due course in the Quarterly Transactions. The first portion of this list, as presented to the meeting, embraced the *Adephaga* to the *Hydrophilidæ*, while the introduction gave some very interesting information as to the nature and extent of the areas which have been worked, together with notes on the occurrence of rare and specially interesting forms.

The SECRETARY also contributed a note upon a simple form of constant pressure injecting apparatus, which he exhibited to the meeting, devised to meet the ordinary requirements of histological work. In design it differed from the forms usually recommended, the requisite pressure being obtained from air driven by an atomising bulb into a glass reservoir furnished with a valve, the exit-pipe from the reservoir communicating with a vessel holding the injecting fluid, the latter being connected also with a mercurial manometer for registering the pressure employed.

The CHAIRMAN commented upon the simplicity and apparent efficiency of the contrivance, remarking that it possessed features which would be likely to render it very serviceable in the ordinary work of the laboratory. The SECRETARY, in explaining the construction of the apparatus, spoke of it as having yielded good results in his hands.

Exhibits.—Fine collection of preserved and mounted lepidopterous larvæ, by Mr. G. H. STORER. Living specimens of the Great Crested Newt (*Triton cristatus*), and Smooth Newt (*Lophinus punctatus*), together with two cast skins of *Triton cristatus*, mounted on card, by Mr. G. MACLACHLAN. Simple form of Constant Pressure Injecting Apparatus, by the SECRETARY.

May 18.—A party of ten members and two visitors visited Bardon Hill, permission to explore which had been kindly granted by W. T. Everard, Esq., of Bardon Hall.

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This, the first excursion of the season, proved in every way a most enjoyable one. Leaving Leicester by the 2.30 train, the party, on arriving at Bardon, proceeded at once to ascend the hill, from whose summit—the weather being favourable—the view, for which this elevation is so justly celebrated, was much admired. A descent was afterwards made in the direction of the granite quarries, and after inspecting these the members returned to the station. Before leaving, a hearty vote of thanks was unanimously accorded to Mr. Everard, and the SECRETARY was desired to convey to him the expression of the Section's indebtedness for his kindness.

During the afternoon the woods and plantations were searched with fair results, many objects of interest being collected by the members.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "D."

Chairman—Mr. F. T. Mott, Birstal Hill, Leicester.

Secretary—Mr. J. J. W. Knowles, 25, St. Stephen's Road, Leicester.

Evening Meetings.—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days.—The second Wednesday afternoon in each summer month.

EVENING MEETINGS.

1889.

July 17.—1. Exhibition of germinating seeds, showing the cotyledons.

2. Paper.

August. —No Meeting.

Sept. 18.—1. Exhibition of live Frogs for comparison of size, colour, and markings.

2. Paper on "The Leicestershire *Cruciferæ*," by the Chairman.

In addition to the formal business, members are invited to bring for exhibition any objects which may be of interest to the Section, or to propose questions for discussion.

FIELD DAYS.

July 10.—To Mountsorrel Hill and Buddon Wood, by train to Sileby.

August. —No Excursion.

Sept. 11.—To the Castle Hill, near Beaumont Leys.

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—F. M. Pope, M.B., Campbell House.

Secretary.—F. R. Rowley, Town Museum.

EVENING MEETINGS.

July 15.—Paper by Mr. Montagu Browne, F.Z.S., "Notes upon the Fossil Fishes of the County, with special reference to a recently-discovered *Chondrosteus*, new to Science, from Barrow-on-Soar" (illustrated by specimens).

August.—No Meeting.

Sept. 2.—Paper by Mr. H. E. Quilter, "Centipedes and Millipedes" (illustrated by specimens and diagrams).

The Paper for the evening will be read at 7.45, any business before the Section being then adjourned.

N.B.—The dates of Field days, with the localities to be visited, will be arranged at the ordinary Monthly Meetings of the Section.

F. M. POPE, *Chairman.*

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ANNUAL REPORTS

OF THE

LEICESTER

Literary and Philosophical Society.

FIFTY-SECOND SESSION,

1886-7.

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OFFICERS OF THE SOCIETY FOR THE PAST SESSION, 1886-87.

President:

REV. JOHN PAGE HOPPS.

Vice-Presidents:

F. T. MOTT, F.R.G.S.
JAMES PLANT, F.G.S.
W. N. REEVE, F.S.A.
GEORGE STEVENSON.

Council:

Retiring June, 1887.	Retiring June, 1888.
REV. A. P. DAWSON, M.A.	REV. E. ATKINS, B.Sc.
J. E. M. FINCH, M.D.	R. HARVEY, LL.B.
W. A. VICE, M.B.	T. CARTER, LL.B.
J. D. PAUL, F.G.S.	C. W. COOPER, M.B.
A. H. PAGET.	REV. JAMES WENT, M.A.
E. F. COOPER, F.L.S.	W. KELLY, F.S.A., F.R.H.S.
G. B. FRANKLIN.	T. C. LEE.
W. S. FRANKS, F.R.A.S.	J. H. GARNAR.
HENRY TOMKINS, M.D.	E. CLEPHAN.
H. BILLSON.	W. KEMPSON.
J. M. GIMSON.	C. BAKER.
WILLIAM JACKSON.	F. M. POPE, M.B.

Treasurer:

ALFRED PAGET.

Honorary Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON, Jun.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1887-88.

President:

A. H. PAGET.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
W. N. REEVE, F.S.A.
GEORGE STEVENSON.

Council:

Retiring June, 1888.	Retiring June, 1889.
R. HARVEY, LL.B.	H. BILLSON.
T. CARTER, LL.B.	E. F. COOPER, F.L.S.
C. W. COOPER, M.B.	REV. A. P. DAWSON, M.A.
REV. J. WENT, M.A.	J. E. M. FINCH, M.D.
W. KELLY, F.S.A., F.R.H.S.	G. B. FRANKLIN.
T. C. LEE.	J. M. GIMSON.
J. H. GARNAR.	W. JACKSON.
E. CLEPHAN.	C. A. MOORE, M.D.
W. KEMPSON.	J. D. PAUL, F.G.S.
C. BAKER.	JAMES PLANT, F.G.S.
F. M. POPE, M.B.	HENRY TOMKINS, M.D.
REV. J. PAGE HOPPS.	W. A. VICE, M.B.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON, Junr.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:

Under the old Deed of Transfer from the Society.

Those only are qualified to act who remain Members of the Society.

G. SHAW, M.D.
A. PAGET.
S. S. BANKART.

TOWN COUNCIL COMMITTEE:

Ten Members of the Council.

ALD. KEMPSON, CHAIRMAN.
ISRAEL HART, MAYOR, *Ex Officio.*
ALD. ALMOND.
ALD. ANDERSON.
ALD. BENNETT.
MR. BURGESS.
MR. COLLIN.
MR. ELSE.
MR. FRANKLIN.
MR. MOTT.
ALD. PAGET.

Six Gentlemen not Members of the Council.

C. BAKER.
H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.
A. RUST.

HONORARY CURATORS:

ALD. KEMPSON.
J. D. PAUL, F.G.S.
ALD. PAGET.
A. H. PAGET.
H. BILLSON.
A. RUST.

CURATOR:

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Abell, Isaac 1880
Adderly, Alfred... 1873
Allen, Charles Gordon 1886
Almond, Thomas 1870
Anderson, John Stafford ... 1874
Atkins, Arthur Frederick ... 1878
Atkins, Rev. Edward, B.Sc. ... 1876
Baines, Alexander 1874
Baines, William ... ...
Baker, Charles 1861
Baker, Frank, C.E. 1886
Barfield, Samuel 1866
Barfoot, William 1874
Bate, J. Stringer 1886
Bates, William Henry 1862
Bennett, John 1870
Biggs, Rev. Henry Sylvanus, B.A. 1885
Billson, Chas. J., M.A. ... 1883
Billson, Henry 1871
Billson, William 1852
Blunt, George Henry 1873
Blunt, Thomas, M.D. 1885
Bramley, William Forrester ... 1868
Bremner, Alex Trackman, L.R.C.P. 1886
Brierley, Jas. L. 1880
Brown, Henry 1886
Burchnall, William 1877
Burford, Samuel Francis ... 1884
Burgess, Alfred Howard ... 1871
Burgess, John Gulson 1870
Burton, John William 1874
Carnley, Samuel Birch... ... 1879
Carter, Thomas, LL.B. ... 1872
Catlow, George Spawton ... 1883
Challis, Francis James... ... 1877
Chamberlain, Lionel Percy ... 1875
Chamberlayne, William ... 1879
Chattaway, John Gordon ... 1880
Clarke, John Webster 1870
Clarke, Samuel 1850
Clayton, Rev. Lewis, M.A. ... 1876
Clements, R. Newton 1885
Clephan, Edwin 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A. ... 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cooper, Chas. Wm., M.D. ... 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cowan, George 1871
Crofts, John Ephraim 1880
Cumberland, Arthur 1875
Davis, John Henry 1886
Davis, Samuel 1871
Davis, Samuel *(Hinckley)* ... 1884
Dawson, Rev. Ambrose P., M.A. 1878
Deakin, John 1874
Donisthorpe, Hamilton... ... 1886
Draper, Arthur Thomas ... 1879
Dunmur, T. M.... 1886
Dutton, Edmund 1885
Elgood, Thomas Scott 1885
Ellery, Henry George 1886
Ellis, Edward Ernest 1879
Ellis, Mrs. E. S. 1886
Ellis, Frederick... 1881
Ellis, George Henry 1870
Ellis, Herbert 1886
Ellis, Mrs. James 1886
Ellis, Mrs. J. H. 1886
Ellis, W. Henry 1885
Else, Alfred 1860
Elton, Joseph William... ... 1875
Evans, Arthur 1881
Evans, Thomas Merritt... ... 1859
Evans, William... 1858
Everard, John Breedon ... 1870
Ewing, Joseph 1871
Finch, J. E. Montagu, M.D. ... 1870
Firth, Solomon 1884
Fleming, Josiah... 1880
Fortescue, Rev. Hugh John, M.A. 1877
Franklin, George Barton ... 1849
Franks, Wm. Sadler, F.R.A.S. 1875
Froane, James 1870
Gascoine, John 1886
Garnar, John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George 1878
Gibbs, Arthur W. 1886
Gibson, Major James Johnson... 1886
Gimson, Arthur James.. ... 1879
Gimson, J. Mentor 1872

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Gimson, Sydney A. 1883
Gittins, Miss Edith 1886
Goddard, Miss E. A. 1886
Goddard, Joseph 1878
Goddard, Joseph Wallis ... 1886
Gordon, Joseph 1881
Goward, Rowland Sydney ... 1883
Green, George 1870
Green, James 1879
Grimsdick, George J. 1886
Grundy, Walter Edward ... 1873
Gunn, Thomas James 1874
Hack, Matthew 1860
Hames, Joseph 1844
Hardy, Arthur 1880
Harper, G. P., M.A. 1885
Harris, Edgar J. 1886
Harris, John Dove 1873
Harris, Joseph 1862
Harrison, Joseph 1885
Hart, Israel 1885
Harvey, Joseph 1870
Harvey, Robert, LL.B. ... 1877
Hawkes, James 1883
Haxby, Joseph Barber 1854
Henton, George 1880
Hewitt, Francis 1862
Hibbert, George Radford ... 1882
Higgins, William Henry, M.B. 1883
Higgs, Alfred, M.D. 1883
Hitchcock, James William .. 1877
Hobson, William Stephen ... 1876
Hodges, Frank Henry 1885
Hodges, George Henry 1860
Hodges, John Edward 1860
Hopps, Rev. John Page ... 1876
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Robert 1865
Hunt, Isaac 1886
Hunt, Mrs. William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jackson, William 1863
Jacobs, Sidney K. 1884
Jacques, Edwin 1873
Johnson, George Gibson ... 1886
Johnson, Mrs. Payne 1886
Johnson, Thomas Fielding ... 1852
Johnson, Thomas Fielding, jun. 1880
Jones, George Howell 1874
Jones, Thomas 1884
Jones, Trevor Bowmar 1886
Kelly, Wm., F.R.H.S., F.S.A. 1837
Kempson, William 1849
Kilby, Edwin Charles 1885
Kirby, Francis John Forsell ... 1870
Kirby, George L. 1884
Kirby, Henry Thomas 1870
Kirby, John 1872
Landon, Joseph Margulus ... 1885
Lawrence, Joseph Charles ... 1876
Lawrence, Thomas 1877
Lawford, James 1872
Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Lee, John Sutton 1873
Leicester, Miss Ellen 1886
Livens, Frederick 1874
Lockhart, Philip H. 1886
Loseby, Edward T. 1873
Lovell, John J. 1879
Macaulay, Thomas, F.R.G.S. (*Kibworth*) 1882
Manners, Lord John, M.P. ... 1843
Maxfield, Matthew ... ...
McCall, John Henry 1884
Medworth, James Henry ... 1870
Milne, John 1883
Moore, Chas. Arthur, M.D. ... 1883
Moore, Frank 1884
Mott, Frederick Thompson, F.R.G.S. 1849
Newby, William Thomas ... 1873
Norman, Henry, B.A., B.D. ... 1878
Odell, George 1876
Oldershaw, Christopher ... 1885
Overton, Robert 1885
Packe, Charles, F.L.S. (*Stretton Magna*) 1874
Packe, Hussey (*Prestwold*) ... 1879
Paget, Alfred 1835
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Partridge, Samuel Steads ... 1876
Paul, John Dennis, F.G.S. ... 1877
Payne, George 1879
Pegg, Abraham 1873
Pegg, Charles 1886
Pegg, John 1879
Pickard, Ezra 1885
Pickard, James Eastwood ... 1885
Pilgrim, John Thomas 1883
Plant, Horace Walter 1874
Plant, James, F.G.S. 1866
Pochin, Robert 1885
Pollard, William Gamble ... 1885
Pope, Frank M., M.D. 1885
Preston, Rev. Thomas Arthur, M.A. (*Thurcaston*) 1885
Ranson, George 1875
Raven, William 1886
Reed, Rev. Martin, M.A. ... 1883
Reeve, Wm. Napier, F.S.A. ... 1846
Richardson, John G. F. ... 1886
Richmond, Edmund 1874

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Roberts, Harry William ... 1882
Roberts, Joseph Drayton ... 1879
Roberts, Thomas 1880
Robinson, Charles Stephen ... 1879
Rodgers, Herbert Parr 1885
Roper, Joseph 1870
Rose, J. G. 1886
Rowlett, William Tertius ... 1885
Royce, David C., jun. 1881
Russell, Herbert 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of 1843
Sargent, John Richard... ... 1882
Sarson, John Edward 1880
Scampton, John... 1870
Sculthorpe, William 1886
Shaw, George, M.D. 1835
Simmons, James 1885
Simpson, J. Woodhouse ... 1886
Simpson, William, jun. ... 1877
Sloane, John, M.D 1883
Spencer, Charles Alfred ... 1884
Spencer, John 1855
Spencer, William 1883
Stafford, John 1852
Stafford, John Thomas... ... 1877
Stanyon, William 1874
Stevenson, George 1844
Stevenson, George Frederick ... 1883
Stocks, Rev. John Edward, M.A. 1885
Stretton, Clement 1850
Stretton, Clement E., C.E. ... 1886
Swain, Robert Paddy 1879
Tait. James 1873
Taylor, T. Smithies 1886
Taylor, W. 1886
Thompson, William Thomas ... 1881
Thorp, John T. 1870
Toller, Richard 1835
Toller, Richard Seddon ... 1886
Tomkins, H., M.D. 1885
Toone, Joseph 1879
Turner, George C. 1878
Turner, William Henry ... 1881
Underwood, Charles 1880
Vaughan, Rev. David J., M.A. 1860
Viccars, George Herbert ... 1878
Viccars, William Purden ... 1885
Vice, John Henry 1885
Vice, William Armston ... 1880
Vincent, William Wilkins ... 1885
Vipan, James Vipan 1885
Walker, Theodore 1869
Walker, William Ralph ... 1885
Wand, Stephen 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Wartnaby, John Wade... ... 1876
Wates, Benjamin Cunningham 1877
Went, Rev. James, M.A. ... 1877
Whitehead, Henry 1872
Whitmore, Walter 1883
Wike, Charles Frogatt 1882
Willcox, Samuel 1879
Williams, John Heath 1854
Wilshere, Thomas 1872
Wilson, Alfred Widnell ... 1882
Winterton, William 1854
Winterton, William Henry ... 1879
Wooding, George 1872
Woolston, Richard 1871
Wright, Thomas 1886
Wright, William 1881
Wykes, Alfred 1878
Wykes, Arthur Bond 1885

LADY ASSOCIATES.

Beale, Miss 1876
Cartwright, Mrs. James ... 1876
Chamberlain, Mrs. 1876
Crossley, Miss Annie 1886
Crossley, Miss Louisa 1886
Deacon, Miss Lucy (deceased)... 1871
Else, Mrs. 1870
Froane, Miss H.... 1876
Goadby, Mrs. 1880
Green, Miss 1883
Harris, Miss F. 1883
Haymes, Mrs. 1874
Hottinger, Miss... 1874
Islip, Mrs. 1885
Jones, Miss Rose Evelyn ... 1886
Kilgour, Miss 1883
Lewitt, Miss A.... 1877
Noble, Miss 1881
Payne, Miss C. E. 1882
Payne, Miss E. 1882
Smith, Miss 1884
Steads, Miss A. 1885
Wallis, Miss 1873
Warren, Miss 1885

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HONORARY MEMBERS.

G. A. K. Wilkes, M.D. ... ...
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham* 1847
John Lawrence, *Elton, Peterborough* 1843
C. Liddell, C.E., *London* 1848
John Smeeton, *London* ... ...
C. Roach Smith, F.S.A., *Strood, Kent* 1853
Joseph Mayer, F.S.A., *Liverpool* 1853
John Rae, M.D., LL.D., *Hudson's Bay House, London*... 1854
Major-General the Hon. Leicester Smythe, C.B. (formerly Curzon) 1855
James Hemming Webb, *Melbourne, Victoria* 1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London* 1861
Walter H. Bates, *London* 1861
John Halford, *Cape of Good Hope* 1866
Rev. R. Harley, F.R.S., F.R.A.S., *4, Wellington Square, Oxford* 1874
Rev. C. C. Coe, F.R.G.S., *Bolton* 1874
Rev. J. Spittal, A.M., *Haywood Rectory, Manchester* 1874
Rev. A. Mackennal, B.A., *Bowden, Manchester* 1877
Rev. W. Romains, M.A., *Wigston* 1879
Dr. C. W. Wood, *Leicester* 1884
Rev. J. P. O. Tomkins, B.A., *Kilby, Leicestershire* 1885

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Report of the Council.

The present Annual Report of the Council records the proceedings of the Society during its FIFTY-SECOND Session.

ROLL OF MEMBERS.

Subscribing Members, 1885-86...	... 264		
Lost by Death	5		
„ Removal	2		
„ Resignation	20—27		
	237		
New Elections during the Session—Gentlemen, 35; Ladies, 9...	44		
Subscribing Members, 1886-87...	...		281
Lady Associates, 1885-86	29		
Lost by Resignation	7		
„ Removal	1—21		
New Elections during the Session	3		
Lady Associates, 1886-87			24
Total Subscribing Members and Lady Associates, 1886-87 ...			305
Honorary Members, 1886-87			21
Total			326

WORK OF THE SESSION.

Twelve General Meetings of the Society have been held during the Session, at which four professional and six non-professional Lectures have been delivered. The evening of Monday, December 20th, 1886, was devoted to a discussion on "Cremation," in which half-a-dozen members took part. On the 7th of February, 1887, some readings were given, preceded by short papers, on Old English Songs and Sonnets. The Lecture of Sir JOHN LUBBOCK was delivered in the Temperance Hall, when the floor of the Hall was reserved for members and visitors admitted by member's orders. The galleries were reserved for persons to whom tickets had been given by the Council, amongst whom were repre-

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sentatives of the Working Men's College, the Co-operative Society, and the Scholastic Association. The Rev. STOPFORD A. BROOKE, who had promised to lecture on the 21st of February, 1887, was prevented from coming to Leicester by illness. The thanks of the Council are due to the PRESIDENT who, at very short notice, undertook to supply Mr. Brooke's place, and gave an interesting address on "William Blake." After his Inaugural Address, on October 11th, 1886, the PRESIDENT distributed the Prizes given to the Science Classes in the town, towards which the Society contributed.

The Programme of the General Meetings was as follows:—

1886.

Oct. 11.—PRESIDENT'S ADDRESS. "Some of the Dangers and Disadvantages of Nineteenth Century Civilization."

,, 25.—LECTURE. FREDERIC HARRISON, Esq., M.A. "The City: Ancient, Mediæval, Modern, and the Ideal."

Nov. 8.—LECTURE. Rev. H. R. HAWEIS, M.A. "Music and Noise."

,, 22.—LECTURE. Prof. SMITHELLS, B.Sc., F.C.S. (Yorkshire College, Leeds). "Vapour," (with experiments and Diagrams, illustrating the results of work done since 1877 in solidifying and liquefying the supposed "permanent" gases).

Dec. 6.—LECTURE. Mrs. HENRY FAWCETT. "The Social Position of Women: its progress during the last 100 years."

,, 20.—A DISCUSSION. Introduced by Dr. BLUNT. "Cremation: from Philosophical, Scientific, and Sanitary points of view."

1887.

Jan. 10.—LECTURE. Dr. A. C. POPE, M.R.C.S. "Hahnemann: his Life and Work."

,, 24.—LECTURE. Sir JOHN LUBBOCK, Bart., M.P. "Savages: their Ways, Customs, and Ideas." (This Lecture was given in the Temperance Hall).

Feb. 7.—READINGS. Arranged for by the PRESIDENT. "Old English Songs and Sonnets."

,, 21.—LECTURE. The PRESIDENT, on "William Blake: Seer, Artist, Man."

Mar. 7.—LECTURE. Dr. H. W. CROSSKEY, F.G.S. "The Physical History of Great Britain from the Glacial Epoch."

,, 21.—LECTURE. JUSTIN MCCARTHY, Esq., M.P. "The House of Commons: a Picture of its Ways and Principal Figures."

THE SECTIONS.

The Council are glad to see from the Reports and from the Transactions that the Sections generally are doing good work, and maintaining their prosperous condition. They regret, however, that Section B has been obliged to ask the Council to terminate its existence. The causes which contributed to prevent the successful working of this Section are fully set out in its Annual Report. The Council, in accordance with the desire there expressed, will omit Section B from the list of Sections for the present.

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MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

The Tenth Annual Meeting of the Union has been fixed to take place at Malvern, on Wednesday and Thursday, July 6th and 7th.

LADY MEMBERS.

For the first time in the history of the Society, ladies have this year been elected by the Council to the full rights of membership. The Rules of the Society do not expressly exclude ladies from the advantages of membership, and the fact that they had not been nominated before was doubtless due to the influence of custom. The present change of practice appears to be a natural outcome of the alteration which is taking place in the English mind with regard to the position and education of women.

PUBLICATION OF TRANSACTIONS.

Since the last Report of the Council, three numbers of the new Quarterly Series of Transactions have been published and distributed to the members of the Society. The greater frequency of publication has naturally involved a considerable increase of expense and labour, and the Council trust that this has been repaid by the result. They propose to continue the present method of publication during the ensuing year.

ACCOMMODATION OF THE SOCIETY.

In October, 1886, a Committee was appointed by the Council for the purpose of considering the existing arrangement with the Town Council in relation to accommodation, rent, and clerical assistance, and in December this Committee presented a Report which, with a few verbal alterations, was adopted by your Council. The Committee found that the present accommodation was inadequate to the amount of rent paid, and was in various ways unsatisfactory, and also that the Society stood in need of more clerical assistance. They concluded their report with some recommendations as to the erection of a room for the use of the Society. A small deputation was thereupon appointed to confer with the Museum Committee of the Town Council on the subject of this Report, and subsequently a Committee was appointed which laid certain plans, estimates, and other information before the Museum Committee. These are still under consideration.

THE FLORA OF LEICESTERSHIRE.

This work was published last Christmas, and forms a handsome volume of 400 pages, demy 8vo., with two coloured maps of the County, one of which illustrates the Geology, and the other the Botanical Districts, in accordance with the drainage areas. It is well printed and edited, and the Council have recorded their thanks to the Sub-Committee for the trouble which they have taken in preparing it.

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THE SCIENCE CLASSES.

The Council have received the following Report of the Committee on the Science Classes:—"Classes have been held for teaching the same subjects this year as last, and about the same number of pupils have attended them, but the additional class which was commenced for teaching Botany was discontinued in consequence of small attendance. The Committee have from time to time visited the Classes and satisfied themselves that they have been properly conducted and well taught. At the Government Examinations held during last month, twenty-three presented themselves in Animal Physiology, ten in Hygiene, nineteen in Physiography, seven in Theoretical Mechanics, and twenty-four in the different stages of Pure Mathematics. The results of the Examination will not be known for some time.

The Department has intimated that, if the Classes are carried on another Session, a considerably increased amount of apparatus must be provided. The Committee is satisfied that a compliance with the requirement of the Department would be in every way desirable in the interests of the Classes, and that the provision of increased apparatus and eventually of some comparatively inexpensive kind of laboratory in which simple physical experiments could be performed, is the proper course to take to improve the teaching: still as the alterations would necessarily entail better accommodation and increased expenditure, the Committee, after very careful consideration, and bearing in mind the absence of hearty support in the Council to the maintenance of the Classes, does not see its way to incur the increased responsibility. The Committee regrets the discontinuance of the Classes, which they believe were doing much, and might, if they had met with the general support of the Council, have done much more, for the teaching of Science in the town."

FINANCIAL POSITION.

The Council congratulate the Society upon the continued improvement in their financial condition. Commencing the financial year with a balance in hand of about £12, the Hon. Treasurer is now able to carry forward towards the coming year some £20. This result has been obtained partly by an increase of revenue, and partly by a considerable decrease in the expenses of the General Meetings. The increased expenditure upon the printing of the new Transactions, and the Grants of £10 10s. to the Science Teaching Committee and of £50 to the "Flora of Leicestershire," prevent the Balance Sheet from fully showing the great reduction which has taken place this year in the ordinary working expenses of the Society.

NEW PRESIDENT.

The Council have unanimously elected A. H. Paget, Esq., as President for the ensuing Session.

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LITERARY AND PHILOSOPHICAL SOCIETY.

Statement of Accounts—1886—7.

Dr. *RECEIPTS.*

	£ s. d.	£ s. d.
To Balance in Treasurer's hands—		
General Fund	8 3 6	
Boulder Fund	4 0 0	
		12 3 6
,, Members' Subscriptions		294 0 0
,, Lady Associates' ,, ...		12 12 0
,, "Flora of Leicestershire," payments for Subscribers' copies		48 7 0
		£367 2 6

PAYMENTS. *Cr.*

	£ s. d.	£ s. d.
By Rent of Rooms at Museum		75 0 0
,, Expenses connected with Lectures at the Society's Meetings—		
Lecturer's Fees	45 3 0	
Incidentals connected with Lectures ...	15 11 3	
		60 14 3
,, Subscriptions—		
Scottish Meteorological Society ...	0 10 6	
Midland Union of Natural His. Societies	3 6 0	
Science Classes Fund	10 10 0	
		14 6 6
,, Printing and Stationery		54 4 0
,, Advertising		6 2 6
,, President's Portraits		6 6 0
,, Collecting Subscriptions		6 6 0
,, John Biggs, gratuity		4 4 0
,, Miscellaneous Expenses		14 16 6
,, Iron Cupboard for Books		3 10 0
,, Expenses connected with the publication of the "Flora of Leicestershire" ...		101 6 6
,, Balance in Treasurer's hands—		
General Fund	16 6 3	
Boulder Fund	4 0 0	
		20 6 3
		£367 2 6

FLORA OF LEICESTERSHIRE FUND.

RECEIPTS.

	£ s. d.
To 96 Subscribers' copies at 10s. ...	48 0 0
One damaged copy	0 7 0
To Balance ...	52 19 6
	£101 6 6

PAYMENTS.

	£ s. d.
By Printer's A/c ...	97 16 0
,, Advertisements	2 12 6
,, Bookseller's Commission	0 18 0
	£101 6 6

Examined and found correct, June 24th, 1887 } EDWIN CLEPHAN, T. C. LEE.

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Officers of the Sections—1886-87.

———o———

SECTION "A." ... ... MR. W. JACKSON, CHAIRMAN.

MR. J. SCAMPTON, SECRETARY.

SECTION "B." ... ... REV. E. ATKINS, CHAIRMAN.

MR. W. S. FRANKS, SECRETARY.

SECTION "C." ... ... MR. J. D. PAUL, CHAIRMAN.

MR. A. F. ATKINS, SECRETARY.

SECTION "D." ... ... MR. F. T. MOTT, CHAIRMAN.

MR. C. W. COOPER, SECRETARY.

SECTION "E." ... ... MR. F. M. POPE, CHAIRMAN.

MR. W. A. VICE, SECRETARY.

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Officers of the Sections—1887-88.

———o———

SECTION "A." ... ... MR. WM. JACKSON, CHAIRMAN.

MR. J. SCAMPTON, SECRETARY,
1, Pelham Street.

SECTION "C." ... ... MR. C. A. MOORE, CHAIRMAN.

MR. A. F. ATKINS, SECRETARY,
124, London Road.

SECTION "D." ... ... MR. HENRY TOMKINS, CHAIRMAN.

MR. C. W. COOPER, SECRETARY,
King Street.

SECTION "E." ... ... MR. W. A. VICE, CHAIRMAN.

MR. F. ROWLEY, SECRETARY,
The Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—MR. WM. JACKSON, Loseby Lane.

Secretary—MR. JOHN SCAMPTON, 1, Pelham Street.

Members.

BAKER, C.
BILLSON, C. J., M.A.
BRODIE, J. D.
CARTER, T., LL.B.
DAWSON, REV. A. P., M.A.
GARNAR, J. H.
GIMSON, J. M.
HARVEY, R., LL.B.
HARVEY, J.
JONES, T.
KELLY, W., F.S.A.
LEE, T. C.
LEWIS, M. L., M.A.
MOTT, F. T., F.R.G.S.
PAGET, A. H.
PAUL, J. D., F.G.S.
SIMPSON, W., JUNR.
STEVENSON, G. F.

Members (continued).

THOMPSON, W. T.
TURNER, O. G.
WENT, REV. J., M.A.
WIKE, C. F.

Sectional Associates.

BILLSON, MRS. C. J.
BILLSON, MISS C. J.
DAWSON, MRS. A. P.
ELLIS, MISS H.
HARVEY, MRS. R.
ISLIP, MRS.
LAW, E. E.
SQUIRES, MISS A.
STANYON, MISS L.
TAYLOR, T. C.
TAYLOR, W.

This Section has held during the past Session five meetings, with an average attendance of twelve members.

The following Papers have been read:—

Tuesday, Oct. 12th, 1886. "*An account of some of the Ancient Buildings of Leicester*," by Mr. WM. JACKSON.

Tuesday, Nov. 9th, 1886. "*Shakespeare's Library*," by Mr. C. J. BILLSON, M.A. "*An Old Law Reporter*," by Mr. R. HARVEY, LL.B.

Tuesday, December 14th, 1886. "*Trial by Jury in Ancient Leicester*," by Mr. WM. SIMPSON, Junr. "*The opening of some of Shakespeare's Tragedies*," by Mr. A. H. PAGET.

Tuesday, February 8th, 1887. "*Lourdes and Leicester*," by Mr. J. D. PAUL, F.G.S.

Tuesday, March 8th, 1887. "*Local Names*," by Mr. THOS. CARTER, LL.B.

At this meeting Mr. WM. JACKSON was re-elected Chairman, and Mr. JNO. SCAMPTON was re-elected Secretary for the ensuing Session.

WM. JACKSON, *Chairman.*

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REPORT OF SECTION "B."

FOR ASTRONOMY, PHYSICS, AND CHEMISTRY.

Roll of Members and Sectional Associates.

Chairman.—REV. E. ATKINS, B.Sc.

Secretary.—W. S. FRANKS, F.R.A.S., Assoc. A.A.S.

Members.	*Sectional Associates.*
ATKINS, A. F.	ATKINS, E. J., B.A.
BILLSON, C. J., M.A.	GODDARD, J.
BILLSON, H.	HAWTHORN, J. H.
BURFORD, S. F., F.C.S.	LAW, E. E., B.A.
GIMSON, A. J.	
HAWLEY, A. E.	
MEADOWS, H., M.B.	
PACKE, C., F.L.S.	
PAUL, J. D., F.G.S.	
POYSER, A. W.	
SARGENT, J. R.	
THOMPSON, W. T.	

The Section has met four times since the date of last annual report. On two of these occasions papers were read, as follows:—

Feb. 17, 1887. "*Time and Gravitation*," by Rev. E. ATKINS, B.Sc.

Mar. 24. "*Periodical Law in relation to the chemical elements*," by S. F. BURFORD, F.C.S.

The position of this Section is at present somewhat anomalous, and its continued existence only possible under greatly modified conditions. To be successful in the future it must be entirely reconstituted, and placed on such a footing as will enable the members to undertake real practical work. The utter absence of any kind of apparatus has been, from the commencement, an almost insuperable barrier to the investigation of physical problems, however promising the field of research might be. It would, of course, be quite unreasonable to expect that mechanical work could be done without first providing the necessary tools; and this applies just as forcibly to scientific enquiries, which involve the employment of a good deal of apparatus. The purchase of sufficient apparatus to cover even the elementary requirements of a section whose title embraces the whole range of physical science, from Astronomy down to Chemistry, would be a very costly matter. There would not, in fact, be sufficient students to justify the outlay of so much money; and consequently some other alternative must be sought. The most feasible idea would appear to be that of restricting the scope of the section to some definite branch of physical science; and concentration of its energies within narrower limits would be far preferable to the mere dabbling in a multitude of subjects. Yet the successful pursuit of even one branch like chemistry

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would depend largely on the power to make experimental researches, and this would mean a properly equipped laboratory.

Viewing, then, the prospects of Section B. in a general way, it would seem as if its condition was almost hopeless; depending, as it does, on circumstances which are beyond its control. The botanist, the geologist, or the naturalist, may find useful occupation in exploring the wonders of his own county, and his requisite tools are so few that they can be conveniently carried on the person. But the astronomer, the physicist, or the chemist, is not so fortunately situated. His studies have no immediate connection with any particular locality, and their publication is devoid of that special interest which attaches to purely local matters. Moreover, he is heavily handicapped in being obliged to depend on apparatus which is often cumbersome and costly. In a town like Leicester there are so few persons working at the same branch of physical science, that community of action is scarcely possible. And if gathered together on so artificial a basis as that of Section B. there is no common bond of sympathy, because every department requires some amount of technical knowledge in order to appreciate its peculiar work, and it is precisely this want of acquaintance with elementary technicalities that prevents the members entering into each other's work. The representatives of the Section can, therefore, only express their opinion as to the inadvisability of continuing its work, and recommend the Council to omit it from the forthcoming list of Sections. In anticipation of the Council accepting this recommendation, no officers have been elected for the coming year.

EDWARD ATKINS, *Chairman.*

REPORT OF SECTION "C."

FOR GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—J. D. PAUL, F.G.S., 118, Regent Road.

Secretary—A. F. ATKINS, 124, London Road.

Members.

ANDERSON, J. S.
BAKER, FRANK.
DRAPER, A. T.
DUTTON, E.
FRANKS, W. S., F.R.A.S.
MOORE, C. A., M.D.
ROBERTS, T.
SARGENT, J. R.
SCAMPTON, J.
VICE, W. A., M.B.
WIKE, C. F.

Sectional Associates.

AMOS, E.
BATES, E. F.
HODGES, L.
QUILTER, E. H.

J. D. PAUL, *Chairman.*

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REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY & BOTANY).

Roll of Members and Sectional Associates.

Chairman.—F. T. MOTT, F.R.G.S., Birstal Hill, near Leicester.

Secretary.—C. W. COOPER, M.B., King Street, Leicester.

Members.	*Sectional Associates.*
BAINES, ALEX.	ADDERLY, MISS
BARFOOT, W., J.P.	BATES, F.
BILLSON, C. J., M.A.	BATES, E F.
CARTER, T., LL.B.	BOLUS, MISS
COOPER, E. F., F.L.S.	COOPER, MISS
FINCH, J. E. M., M.D.	GRUNDY, MISS
GARNAR, J. H.	HEWITT, MISS
GRUNDY, W. E.	MOTT, MRS.
OVERTON, R.	NOBLE, MISS M.
PRESTON, REV. T. A., M.A.	PALMER, T.
THORP, J. T.	QUILTER, H. E.
TOMKINS, H., M.D.	SHENTON, MISS
TURNER, C. G.	SLOANE, MISS
VICE, W. A., M.B.	SLOANE, MISS M.
VINCENT, W.	THIRLBY, T. H.
WATCHORN, T.	WARD, G.
WIKE, C. F.	

Members, 35; viz.:—Members of the Society, 19; non-members, 16.

Evening Meetings:—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days:—The second Wednesday in each summer month, at 3 to 4 p.m.

The Section has held twelve meetings during the past year, the Report being now made up to the end of May. The attendance has varied from six to fourteen, the average being eleven, viz.: eight gentlemen and three ladies.

The Section has lost by removal and resignation three members, and four new ones have been elected, giving an addition of one to the total.

Four field meetings have been held during the year, viz.: June—to Tilton Hill. July—to Burbage Wood and Common. April—to the Old Ansty Lane. May—to Belvoir Castle.

Nine short papers have been read and discussed at the evening meetings of the Section, viz.:

June 16, 1886. "*The various contrivances for insuring cross-fertilization in Orchids*," by the Rev. T. A. PRESTON, M.A.

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July 21. "*The Hairless Condition of the Human Skin*," by the CHAIRMAN.

September 15. "*Rats, and the occurrence of the Black Rat in Leicestershire*," by the CHAIRMAN.

October 20. "*The Metamorphoses of Galeruca nymphæa, a coleopterous insect*," by Mr. H. E. QUILTER.

November 17. "*The Cultivated Bacillus of Anthrax*," by Dr. H. TOMKINS.

December 15. "*Foreign Fruits available for acclimatization in England*," by the CHAIRMAN.

January 19, 1887. "*The observation and recording of Phenological Phenomena*," by Rev. T. A. PRESTON, M.A.

March 16. "*The Voices of Animals*," by the CHAIRMAN.

May 18. "*The Entomostraca*," by Mr. J. H. GARNAR.

DISCUSSIONS.

The Section has adopted the plan, during the latter part of this Session, of introducing at each evening meeting a definite subject for discussion, announced beforehand. These discussions have been lively and instructive. The following subjects have been taken up, viz. :—

1. Is Bird-Song Music?
2. The relations between Evergreen and Deciduous Trees and Shrubs.
3. The biological meaning and action of a Stimulant.
4. The relations between Univalve and Bivalve Shells.
5. Cleistogamous Plants.
6. A Botanical Garden for Leicester.

Brief reports of the Discussions, and the results of the Field-day Excursions will be found in the Quarterly Transactions of the Society.

"The Flora of Leicestershire," upon which the Botanical Sub-Committee have been engaged for about twelve years, was published at the end of December. It forms a handsome demy 8vo volume of 400 pages with two coloured maps of the County, and, although the Sub-Committee are not ignorant of its defects they believe that it is equal to the average of such works, and that the Society's funds have not been uselessly expended in its production. The cryptogamic department of the volume, extending to 150 pages, is an almost unique feature in local

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Floras. Mr. F. Bates's account of the Algæ is particularly excellent, and anything referring to the curious but little known Desmidieæ is so rare that even the imperfect record contained in this volume is sure to be of value.

The origin of the work and something of the methods employed in preparing it are noticed in the preface, but only those who have done work of a similar nature are likely to appreciate the labour, time and expense involved in its preparation. About half the travelling expenses were paid by the Council, everything else has been provided by the Sub-Committee. It has occupied a large share of their very limited leisure for twelve years; the labour of Indexing was a heavy item, and the List of Fungi was entirely re-written four times before being committed to the press.

To the Sub-Committee, however, it has been a labour of love, and they desire very heartily to acknowledge the handsome manner in which they have been met by the Council in all matters connected with the preparation and publication of the work.

F. T. MOTT, *Chairman.*

REPORT OF SECTION "E."

FOR ZOOLOGY.

Roll of Members and Sectional Associates.

Chairman—F. M. POPE, M.B., London Road.

Secretary—W. A. VICE, M.B., Belvoir Street.

Members.

ANDERSON, J. S.
BURCHNALL, W.
HARVEY, R., LL.B.
MACAULAY, T., M.R.C.S.L.
PAUL, J. D., F.G.S.
PAYNE, MISS
POPE, F. M., M.B.
RICHMOND, E.
RUST, A.
WALKER, T.

Sectional Associates.

BARBER, MISS M.
BROWNE, MONTAGU, F.Z.S.
EVANS, W. A.
GRISWOLD, H. J.
HEADLY, B.
HOW, F. F.
MATTHEWS, REV. A., M.A.
PALMER, G.
PALMER, G.
QUILTER, H. E.
SQUIRES, MISS
SQUIRES, MISS A.
STORER, G. H.

F. M. POPE, *Chairman.*

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METEOROLOGICAL OBSERVATIONS,

TAKEN AT THE TOWN MUSEUM, LEICESTER,

AT 9 P.M.

1886.	Barometer	Dry.	Wet.	Highest		Lowest.		Rain.	Sunshine.
				Max.	Max.	Min.	Min.		
January...	29.647	36.0	34.6	39.4	51.0	31.5	25.2	2.56	45.25
February	30.140	34.5	32.7	38.4	48.5	30.1	24.5	0.31	35.90
March ...	29.972	41.3	38.9	45.9	64.5	33.3	17.5	2.36	61.30
April ...	29.919	48.5	42.7	53.1	69.6	36.2	30.0	2.14	109.85
May ...	29.913	53.1	48.8	58.6	73.6	41.8	32.0	4.90	121.50
June ...	29.979	57.9	53.8	63.3	78.6	45.5	38.2	1.50	129.75
July ...	29.891	63.1	58.0	69.4	85.0	51.2	46.2	3.74	169.05
August ...	29.976	62.9	58.7	68.7	85.0	51.3	44.0	1.80	153.45
September	29.921	57.4	53.6	64.4	78.8	48.3	41.0	1.60	104.85
October...	29.789	53.0	50.7	57.8	77.5	46.6	38.4	4.23	61.65
November	29.899	44.4	42.9	47.2	58.6	37.7	28.5	1.99	41.25
December	29.667	35.7	34.9	40.4	53.5	30.3	18.5	3.67	32.55
Averages..	29.876	49.0	45.8	52.2	68.7	40.3	32.2	30.82	1066.35

J. C. SMITH,

The Museum. *Observer.*

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RULES OF THE LEICESTER

LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Object. THE object of the Society shall be the general cultivation of Literature, Science, and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, a Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council, shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meetings, in conformity

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with Rule I. The discussion of theological or political questions, either by Lecturers or Speakers, is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any Member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately destroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Section, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next meeting of the Council, and submitted for election at a subsequent meeting. All such elections shall be announced at the ordinary meeting of the Society next ensuing.

IX.

Subscription.

Each Member shall pay an annual subscription of One Guinea, which shall entitle him (1) to a member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII.

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s. 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors. Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentleman resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations. Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds. After payment of the expenses of the Society, any surplus funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alteration of Rules. No rule shall be made, rescinded, or altered, without the consent of two-thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-Laws, &c. The Council shall have power to make By-Laws and Regulations not inconsistent with the foregoing Rules.

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BY-LAWS,

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council, on 2nd February, 1883, adopted the following By-Laws :—

1.—Any Member or Associate of the Society may join any Section upon giving in his or her name to the Minute Secretary, who, as soon as six names have been given in for any Section, shall call a meeting of such Section to elect Officers.

2.—Each Member or Associate of the Society who shall join any Section shall pay an Annual Subscription of 1s. to the funds of such Section.

3.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2s. 6d. to the funds of such Section.

4.—Each Section shall elect a Chairman and Secretary. The Chairman shall be a Member of the Society. The Section shall report the election of Officers to the next ensuing meeting of the Council.

5.—Each Section shall prepare and publish at the beginning of each Session a list of the dates of meetings to be held during the Session.

6.—There shall be, annually, at least two General Meetings of the Sections open also to all persons entitled to attend the ordinary General Meetings of the Society, one of such meetings to be held in the Autumn and the other in the Spring. The arrangements for such meetings shall be in the hands of the Officers of the Sections.

7.—Each Section shall, on or before the first Friday in May, present to the Council its Report and Transactions, which, subject to the approval of the Council, shall be published in the Annual Transactions of the Society.

8.—The Council may, on the application of any Section, make grants of money for any object.

ADDED JULY 10TH, 1883.

9.—The Officers of each Section shall go out of office yearly at the Annual Meeting of the Society. The new Chairman and Secretary of each Section shall be elected by the Section at its Ordinary Meeting preceding the Annual Meeting of the Society, and such election shall be reported to the Society at its Annual Meeting. Casual vacancies shall be filled up as they occur by the Sections respectively, and shall be reported to the next Ordinary Meeting of the Council.

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ANNUAL REPORTS

OF THE

LEICESTER

Literary and Philosophical Society.

FIFTY-THIRD SESSION,

1887-88.

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OFFICERS OF THE SOCIETY FOR THE PAST SESSION, 1887-88.

President:

A. H. PAGET.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
W. N. REEVE, F.S.A.
GEORGE STEVENSON.

Council:

Retiring June, 1888.	Retiring June, 1889.
R. HARVEY, LL.B.	H. BILLSON.
T. CARTER, LL.B.	E. F. COOPER, F.L.S.
C. W. COOPER, M.B.	REV. A. P. DAWSON, M.A.
REV. J. WENT, M.A.	J. E. M. FINCH, M.D.
W. KELLY, F.S.A., F.R.H.S.	G. B. FRANKLIN.
T. C. LEE.	J. M. GIMSON.
J. H. GARNAR.	W. JACKSON.
E. CLEPHAN.	C. A. MOORE, M.D.
W. KEMPSON.	J. D. PAUL, F.G.S.
C. BAKER.	JAMES PLANT, F.G.S.
F. M. POPE, M.B.	HENRY TOMKINS, M.D.
REV. J. PAGE HOPPS.	W. A. VICE, M.B.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON, Junr.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1888-89.

President:

REV. A. P. DAWSON, M.A.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
A. H. PAGET.
GEORGE STEVENSON.

Council:

Retiring June, 1889.	Retiring June, 1890.
H. BILLSON.	R. HARVEY, LL.B.
E. F. COOPER, F.L.S.	C. W. COOPER, M.B.
T. CARTER, LL.B.	W. KELLY, F.S.A., F.R.H.S.
J. E. M. FINCH, M.D.	T. C. LEE.
G. B. FRANKLIN.	J. H. GARNAR.
J. M. GIMSON.	E. CLEPHAN.
W. JACKSON.	W. KEMPSON.
C. A. MOORE, M.D.	F. M. POPE, M.D.
J. D. PAUL, F.G.S.	J. J. W. KNOWLES,
JAMES PLANT F.G.S.	H. ELLIS,
HENRY TOMKINS, M.D.	REV. T. A. PRESTON, M.A.
W. A. VICE, M.B.	C. F. WIKE.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON, Junr.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:

Under the old Deed of Transfer from the Society.

THOSE ONLY ARE QUALIFIED TO ACT WHO REMAIN MEMBERS OF THE SOCIETY.

G. SHAW, M.D.
A. PAGET.
S. S. BANKART.

TOWN COUNCIL COMMITTEE:

Ten Members of the Conncil.

ALD. KEMPSON, CHAIRMAN.
THOS. WRIGHT, MAYOR.
Ex Officio.
ALD. ALMOND.
ALD. ANDERSON.
ALD. BENNETT.
MR. BURGESS.
MR. COLLIN.
MR. ELSE.
MR. FRANKLIN.
MR. MOTT.
ALD. PAGET.

Six Gentlemen not Members of the Council.

C. BAKER.
H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.
A. RUST.

HONORARY CURATORS:

ALD. KEMPSON.
J. D. PAUL, F.G.S.
ALD. PAGET.
A. H. PAGET.
H. BILLSON.
A. RUST.

CURATOR:

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Adderly, Alfred... 1873
Allen, Charles Gordon 1886
Almond, Thomas 1870
Anderson, John Stafford ... 1874
Atkins, Arthur Frederick ... 1878
Atkins, Rev. Edward, B.Sc. ... 1876
Baines, Alexander 1874
Baines, William... ... ...
Baker, Charles 1861
Barfoot, William 1874
Bate, J. Stringer 1886
Bates, William Henry 1862
Bennett, John 1870
Billson, Chas. James, M.A. ... 1883
Billson, Henry 1871
Billson, William 1852
Blunt, Thomas. M.D. 1885
Bond, Charles James, F.R.C.S. 1887
Bramley, William Forrester .. 1868
Bremner, Alex. Trackman, L.R.C P 1886
Brierley. Jas. L.... 1880
Brown, Henry 1886
Burchnall, William 1877
Burford, Samuel Francis ... 1884
Burgess, Alfred Howard ... 1871
Burton, John William 1874
Carnley, Samuel Birch 1879
Carter, Thomas, L.L.B. ... 1872
Catlow, George Spawton ... 1883
Challis, Francis James 1877
Chamberlain. Lionel Percy ... 1875
Chattaway, John Gordon ... 1880
Clarke, John Webster 1870
Clarke, Samuel 1850
Clayton, Rev. Lewis, M.A. ... 1876
Clements R. Newton 1885
Clephan, Edwin... 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A. ... 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cook, John Thomas 1887
Cooper, Chas. Wm., M.D. ... 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cowan, George 1871
Crofts, John Ephraim 1880
Cumberland, Arthur 1875
Davis, John Henry 1886
Davis, Samuel 1871
Davis, Samuel *(Hinckley)* ... 1884
Dawson, Rev. Ambrose Pudsey, M.A. 1878
Deakin, John 1874
Donisthorpe, Hamilton.. ... 1886
Draper, Arthur Thomas ... 1879
Dunmur, T. M. 1886
Dutton, Edmund 1885
Elgood, George Samuel... ... 1887
Elgood, Thomas Scott 1885
Ellery, Henry George 1886
Ellis, Edward Ernest 1879
Ellis, Mrs. E. S. 1886
Ellis, Frederick 1881
Ellis, George Henry 1870
Ellis, Herbert 1886
Ellis, Mrs. James 1886
Ellis, Mrs. J. H. 1886
Ellis, Wilfrid Henry 1885
Else, Alfred 1860
Else, Miss Mary Elizabeth ... 1887
Elton, Joseph William 1875
Evans, Arthur 1881
Evans, Thomas Merritt... ... 1859
Evans, William 1858
Everard, John Breedon... ... 1870
Ewing, Joseph 1871
Finch, John E. Montagu, M.D. 1870
Fleming, Josiah... 1880
Fortescue, Rev. Hugh John, M.A. 1877
Franklin, George Barton ... 1849
Froane, James 1870
Garnar, John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George 1878
Gibbs Arthur W. 1886
Gibson, Major James Johnson .. 1886
Gimson, Arthur 1887
Gimson, Arthur James 1879
Gimson, Josiah 1887
Gimson, J. Mentor 1872
Gimson, Sydney Ansell ... 1883
Gittins, Miss Edith 1886
Goddard, Miss E. A. 1886
Goddard, Joseph 1878

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Goddard, Joseph Wallis ... 1886
Gordon, Joseph 1881
Goward, Rowland Sydney ... 1883
Green, George 1870
Green, James 1879
Griffith, Frederick, C.E. ... 1887
Grimsdick, George J. 1886
Grundy, Walter Edward ... 1873
Gunn, Thomas James 1874
Hack, Matthew 1860
Hames, Joseph 1844
Hardy, Arthur 1880
Harper, George Povey, M.A. ... 1885
Harris, Edgar J.... 1886
Harris, Joseph 1862
Harrison, Joseph 1885
Hart, Israel 1885
Harvey, Joseph 1870
Harvey, Robert LL.B. 1877
Hawkes, James 1883
Hayes, Miss Elizabeth A. ... 1887
Hewitt, Francis 1862
Hibbert, George Radford ... 1882
Higgins, William Henry, M.B. 1883
Higgs, Alfred, M D. 1883
Hitchcock, James William ... 1877
Hobson, William Stephen ... 1876
Hodges, Frank Henry 1885
Hodges, George Henry 1860
Hodges, John Edward 1860
Hopps, Rev. John Page... ... 1876
Howcutt, Miss 1887
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Robert 1865
Hunt, Mrs William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jackson, William 1863
Jacobs, Sydney K. 1884
Jacques, Edwin 1873
Johnson, George Gibson ... 1886
Johnson, Mrs. Payne 1886
Johnson, Thomas Fielding ... 1852
Johnson, Thomas Fielding, jun. 1880
Jones. George Howell 1874
Jones, Thomas 1884
Jones, Trevor Bowmar 1886
Kelly, Wm., F R.H.S., F.S.A. 1837
Kempson, William 1849
Kilby, Edwin Charles 1885
Kirby, Francis John Forsell ... 1870
Kirby, George Langford ... 1884
Kirby, Henry Thomas 1870
Kirby, John 1872
Lawrence, Joseph Charles ... 1876
Lawrence, Thomas 1877
Lawford, James 1872

Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Lee, John Sutton 1873
Leicester, Miss Ellen 1886
Livens, Frederick 1874
Lockhart, Philip H. 1886
Loseby, Edward Thomas ... 1878
Lovell, John J. 1879
Macaulay, Thomas, F.R.G.S. *(Kibworth)* 1882
Manners, Lord John, M.P. ... 1843
Maxfield, Matthew... ...
McCall, John Henry 1886
Medworth, James Henry *(Deceased)* 1870
Milne, John 1883
Moore, Chas. Arthur, M.D. ... 1883
Moore, Frank 1884
Moore, Percy 1887
Mott, Frederick Thompson, F.R.G.S. 1849
Newby, William Thomas ... 1873
Oldershaw, Christopher ... 1885
Overton, Robert 1885
Packe, Charles, F.L.S. *(Stretton Magna)* 1874
Packe, Hussey *(Prestwold)* ... 1879
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Partridge, Samuel Steads ... 1876
Pattison, Ernest 1887
Paul, John Dennis, F.G. S. ... 1877
Payne, George 1879
Pegg, Abraham 1873
Pegg, Charles 1886
Pegg, John 1879
Pickard, Ezra 1885
Pickard, James Eastwood ... 1885
Pilgrim, John Thomas 1863
Plant, Horace Walter 1874
Plant, James F.G.S. 1866
Pochin, Robert 1885
Pollard, William Gamble ... 1885
Pope, Frank Montagu, M,D. ... 1885
Pratt, Reginald, M.D. 1887
Preston, Rev. Thomas Arthur, M. A. *(Thurcaston)* 1885
Ranson, George 1875
Raven, William 1886
Reed, Rev. Martin, M.A. ... 1883
Richardson, John George Frederick 1886
Richmond, Edmund 1874
Roberts, Harry William ... 1882
Roberts, Joseph Drayton ... 1879
Roberts, Thomas... 1880
Robinson, Charles Stephen ... 1879
Rodgers, Herbert Parr 1885
Roechling. H. Alfred 1888
Roper, Joseph 1870

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Rose, George John 1886
Rowlett, William Tertius ... 1885
Royce, David C., jun. 1881
Russell, Herbert, ... 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of (*Deceased*) 1843
Sarson, John Edward 1880
Scampton, John 1870
Sculthorpe, William 1886
Shaw, Mrs. Lucy 1887
Simmons, James 1885
Simpson, J. Woodhouse ... 1886
Simpson, William, jun.... ... 1877
Sloane, John M.D. 1883
Spencer, Charles Alfred... ... 1884
Spencer, William 1883
Squires, Miss Augusta 1887
Stafford, John 1852
Stafford, John Thomas 1877
Stanyon, William 1874
Stevenson, George 1844
Stevenson, George Frederick ... 1883
Stretton, Clement 1850
Stretton, Clement Edwin, C.E. 1886
Swain, Robert Paddy 1879
Tait, James 1873
Taylor, Thomas Smithies ... 1886
Taylor, William 1886
Thompson, William Thomas ... 1881
Thorp, John T. 1870
Toller, Richard 1835
Toller, Richard Seddon 1886
Tomkins, Henry, M.D. 1885
Toone, Joseph 1879
Turner, William Henry ... 1881
Underwood, Charles 1880
Vaughan, Rev. David J., M.A. 1860
Viccars, George Herbert ... 1878
Viccars, William Purden ... 1885
Vice, John Henry 1885
Vice, William Armston 1880
Vipan, James Vipan 1885
Walker, Theodore 1869
Walker, William Ralph... ... 1885
Wallace, William J. 1887
Wand, Stephen 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Wartnaby, John Wade 1876
Wates, Benjamin Cunningham 1877
Went, Rev. James, M.A. ... 1877
Whitehead, Henry 1872
Whitmore, Walter 1883
Wike, Charles Froggatt... ... 1882
Willcox, Samuel 1879
Williams, John Heath 1854
Wilson, Alfred Widnell ... 1882
Winterton, William 1854
Winterton, William Henry ... 1879
Wooding, George 1872
Woolston, Richard 1871
Wright, Thomas 1886
Wright, William 1881
Wykes, Alfred 1878
Wykes, Arthur Bond 1885

ASSOCIATES.

Atkins, William (*Market Harboro'*) 1887
Brown, George W. 1887
Cartwright, Mrs. James ... 1876
Chamberlain, Mrs. 1876
Charters, Mrs. Robert 1887
Cooper, Miss 1887
Froane, Miss H. 1876
Fuller, Cecil Charles 1887
Goadby, Mrs. 1880
Green, Miss 1883
Haymes, Mrs. 1874
Hottinger, Miss 1874
Jarvis, Miss 1887
Jones, Miss Rose Evelyn ... 1886
Lewitt, Miss A. 1877
Lilley, Samuel John 1887
Noble, Miss 1881
Payne, Miss Caroline Edith ... 1882
Payne, Miss Eva 1882
Plant, Mrs. Nathaniel 1887
Schmidt, Herr E. 1887
Smith, Miss 1884
Steads, Miss Angela 1885
Toller, Mrs. George 1887
Viccars, Mrs. George 1887

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HONORARY MEMBERS.

G. A. K. Wilkes, M.D.	
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham*	1847
John Lawrence, *Elton, Peterborough*	1843
C. Liddell, C. E., *London*	1848
John Smeeton, *London*	
C. Roach Smith, F.S.A., *Strood, Kent*	1853
John Rae, M.D., LL.D., *Hudson's Bay House, London*	1854
Major General the Hon. Leicester Smythe, C.B. (formerly Curzon)	1855
James Hemming Webb, *Melbourne, Victoria*	1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London*	1861
Walter H. Bates, *London*	1861
John Halford, *Cape of Good Hope*	1866
Rev. R. Harley, F.R.S., F.R.A.S., *4, Wellington Square, Oxford*	1874
Rev. C. C. Coe, F.R.G.S., *Bolton*	1874
Rev. J. Spittal, A. M., *Haywood Rectory, Manchester*	1874
Rev. A. Mackennal, B. A., *Bowden, Manchester*	1877
Rev. W. Romains, M.A., *Wigston*	1879
Rev. J. P. O. Tomkins, B.A. *Kilby, Leicestershire*	1885
Alfred Paget, J.P. *Leicester*	1887
George Shaw, M.D. *Leicester*	1887
William Napier Reeve, F.S.A. (*deceased*)	1887

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Report of the Council.

THE present Annual Report of the Council records the proceedings of the Society during its FIFTY-THIRD Session.

ROLL OF MEMBERS.

Subscribing Members, 1886-87	281	
Lost by Death	3	
„ Removal	4	
„ Resignation	18—25	
	256	
New Elections during the Session—Gentlemen, 10; Ladies, 5...	15	
Subscribing Members, 1887-88		271
Associates, 1886-87	24	
Lost by Death	3	
„ Removal	2	
„ Resignation	6—11	
New Elections during the Session	12	
Associates, 1887-88		25
Total Subscribing Members and Associates, 1887-88 ...		296
Honorary Members, 1887-88		22
Total		318

WORK OF THE SESSION.

Twelve General Meetings of the Society have been held during the Session, at which six professional and six non-professional Lectures have been delivered. Mr. LEONARD COURTNEY'S Lecture on "The Swarming of Men" was given in the Temperance Hall, when the floor of the Hall was reserved for members and for visitors admitted by members' orders, while the galleries were reserved for persons to whom tickets had been given by the Council. Mr. COURTNEY'S Paper has since been published in the "Nineteenth Century" Review for March, 1888. The average attendance of members and their friends at the professional Lectures has been 332; at the non-professional Lectures, 214. The average attendance at all the Lectures of the Session has been 273.

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The Programme of the General Meetings was as follows:—

1887.

Oct. 10.—PRESIDENT'S ADDRESS. "The Poetic Drama of the Present Reign."

,, 24.—LECTURE. Rev. E. ATKINS, B.Sc. "The grained structure of matter."

Nov. 7.—LECTURE. Sir ROBERT S. BALL, LL.D., F.R.S. (Astronomer Royal of Ireland). "How Jupiter and Venus caused the Great Ice Age."

,, 21.—LECTURE. Rev. J. P. O. TOMKINS, B.A. "Charles Lamb."

Dec. 5.—LECTURE. Professor SMITHELLS, B.Sc., F.C.S. (Yorkshire College, Leeds). "The Elements."

,, 19.—W. SIMPSON, Junr., Esq. "Ethical Instinct;" a Paper for discussion.

1888.

Jan. 9.—LECTURE. WILLIAM ARCHER, Esq. "The Stage of the Future."

,, 23.—LECTURE. LEONARD COURTNEY, Esq., M.P. "The Swarming of Men." (This Lecture was given in the Temperance Hall).

Feb. 6.—LECTURE. AUGUSTINE BIRRELL, Esq. "Samuel Richardson."

,, 20.—LECTURE. Rev. J. THEW. "Cowper."

Mar. 5.—LECTURE. ANDREW LANG, Esq. "Puss in Boots."

,, 19.—R. HARVEY, Esq., LL.B. "A Philological Study."

THE SECTIONS.

There are now only four Sections, no attempt having been made to reconstitute Section "B," for Astronomy, Physics, and Chemistry, which came to an end last year. The Reports of all the Sections show that they are in a flourishing condition, and they have all contributed Papers to the Society's Transactions. The Bye-Laws relating to the Constitution and Organization of the Sections have been revised throughout, and adapted to the present system of publishing Quarterly and Annual Reports of the Sections. They also provide for the printing of Sectional Papers in the Quarterly Transactions, subject to the approval of the Council.

THE TRANSACTIONS.

Four numbers of the New Quarterly Series of Transactions have been published during the past Session. This new method of publishing the Transactions has now been shown by two years' experience to be an improvement upon the old system of annual publication, and the Council propose to continue it. Copies of these Quarterly Transactions are presented gratis to every Member and Associate of the Society.

The Editors rely upon the hearty co-operation of the Chairmen of the Sections, without a continuance of which it is impossible for them to issue these quarterly numbers with any punctuality or success.

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ACCOMMODATION OF THE SOCIETY.

The inadequate accommodation of the Society is still under the consideration of your Council. The Stands of Exhibits from South Kensington, which were placed last year in the Lecture Hall, have seriously interfered with the seating of the audiences, and the room has sometimes been over-crowded. Moreover, the increased prosperity of the Museum has caused it to be an inconvenience for the Curator to vacate the present Council Room when it is required for the purposes of the Society; while there are strong objections to the removal of the Council and Sectional Meetings from the present Council Room to the ante-Room of the Lecture Hall. The growing business of the Society will soon render it imperative for the Secretaries to have more clerical assistance than they have at present. All these points will engage the attention of your Council during the coming Session.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

The Eleventh Annual Meeting of the Union has been fixed to take place at Northampton on the 4th and 5th of July.

EXCURSION.

The Council have arranged for the Society to make an excursion to Charnwood Forest on the 11th of July.

THE CAMBRIDGE UNIVERSITY EXTENSION LECTURES.

The Council have voted a sum of £10 towards the support of the Cambridge University Extension Lectures in Leicester.

INTERNATIONAL GEOLOGICAL CONGRESS.

The Triennial International Geological Congress will take place in September, this year, in London. The Society has subscribed to the Congress a sufficient sum to entitle it to all the publications which the Congress may issue. Mr. JAMES PLANT, F.G.S., has been appointed a Delegate to represent this Society at the International Geological Congress.

THE ROMAN PAVEMENT.

150 fac-similes in Chromo-Lithography of the Drawing of the Roman Pavement in Jewry Wall Street, a Photograph of which appeared in the January number of the Transactions, have now been executed by the direction of the Council, and copies can be obtained by members, at the Museum, at the price of Half-a-Crown each.

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HONORARY MEMBERS.

At the commencement of last Session, the Council unanimously elected as Honorary Members of the Society three of its best and oldest friends, Dr. SHAW, Mr. ALFRED PAGET, and Mr. WILLIAM NAPIER REEVE. The Council deeply laments the loss sustained by the Society in the recent death of Mr. REEVE, who was one of its Vice Presidents, who, in the years 1854 and 1882, filled the office of President, and who for 42 years was a valued friend and active supporter of the Society.

NEW PRESIDENT.

The Council have unanimously elected the Rev. A. P. DAWSON, M.A., as President for the ensuing Session.

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STATEMENT OF ACCOUNTS.

1887–1888.

Dr. *RECEIPTS.*

	£	s.	d.	£	s.	d.
To Balance in Treasurer's hands—						
General Fund	16	6	3			
Boulder ,, ...	4	0	0			
				20	6	3
,, Members' Subscriptions				283	10	0
,, Associates' ,, ...				13	2	6
,, Payments for Copies of "Flora of Leicestershire"				4	19	0
,, Sale of Quarterly Transactions				0	8	6
,, ,, Additional Tickets				0	7	6
				£322	13	9

PAYMENTS. *Cr.*

	£	s.	d.	£	s.	d.
By Rent of Rooms at Museum				75	0	0
,, Expenses connected with Lectures at the Society's Meetings—						
Lecturers' Fees	74	6	6			
Incidentals connected with Lectures ...	4	11	9			
				78	18	3
,, Purchase of mounted specimens of Fresh-water Algæ				25	0	0
,, Subscriptions—						
Science Classes	10	10	0			
Cambridge University Lectures	10	0	0			
Midland Union of Natural His. Societies	3	10	3			
Scottish Meteorological Society	0	10	6			
International Geological Congress ...	1	10	0			
				26	0	9
,, Printing and Stationery				48	0	0
,, Advertising				9	13	0
,, Collecting Subscriptions				6	6	0
,, John Biggs, gratuity				4	4	0
,, Lecturer's Desk				4	9	0
,, Copies of Roman Pavement				5	17	0
,, Miscellaneous Expenses				14	4	0
,, Balance in Treasurer's hands—						
General Fund	21	1	9			
Boulder ,, ...	4	0	0			
				25	1	9
				£322	18	9

Examined and found correct, June 18, 1888 { E. CLEPHAN, T. C. LEE.

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Officers of the Sections—1887-88.

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SECTION "A." ... ... MR. WM. JACKSON, CHAIRMAN.

MR. JOHN SCAMPTON, SECRETARY.

SECTION "C." ... ... MR. C. A. MOORE, M.D., CHAIRMAN.

MR. A. F. ATKINS, SECRETARY.

SECTION "D." ... ... MR. H. TOMKINS, M.D., CHAIRMAN.

MR. C. W. COOPER, M.B., SECRETARY.

SECTION "E." ... ... MR. W. A. VICE, M.B., CHAIRMAN.

MR. F. R. ROWLEY, SECRETARY.

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Officers of the Sections—1888-89.

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SECTION "A." ... ... MR. ALFRED H. PAGET, CHAIRMAN.
West Walk.

MR. JOHN SCAMPTON, SECRETARY.
1, Pelham Street, Welford Road.

SECTION "C." ... ... MR. C. A. MOORE, M.D., CHAIRMAN.
New Walk Gates.

MR. LOUIS HODGES, SECRETARY.
St. Martin's Schools.

SECTION "D." ... ... MR. F. T. MOTT, F.R.G.S., CHAIRMAN.
Birstal Hill.

MR. J. W. KNOWLES, SECRETARY.
3, St. Stephen's Road.

SECTION "E." ... ... MR. F. M. POPE, CHAIRMAN.
Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY,
Town Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—MR. WM. JACKSON, Loseby Lane.

Secretary—MR. JOHN SCAMPTON, 1, Pelham Street.

Members.

BAKER, C.
BILLSON, C. J., M.A.
BRODIE, J. D.
CARTER, T., LL.B.
COOPER
DAWSON, REV. A. P., M.A.
GARNAR, J. H.
GIMSON, J. M.
HARPER, G.P., M.A.
HARVEY, R., LL.B.
HARVEY, J.
ISLIP, MRS.
JONES, T.
KELLY, W., F.S.A.
LEE, T. C.
MOTT, F. T., F.R.G.S.
PAGET, A. H.
PAUL, J. D., F.G.S.
ROLLESTON, A. F.
SIMPSON, W., JUNR.

Members (continued).

STEVENSON, G. F.
THOMPSON, W. T.
TURNER, A. G.
WENT, REV. J., M.A.
WIKE, C. F.

Sectional Associates.

BILLSON, MRS. C. J.
BILLSON, MISS C.
DAWSON, MRS. A. P.
ELLIS, MISS H.
HARVEY, MRS. R.
LAW, E. F.
LEWIS, M. L., M.A.
SQUIRES, MISS A.
STANYON, MISS L.
TAYLOR, T. C.
TAYLOR, W.

This Section has held during the past Session five meetings, with an average attendance of eleven members and associates.

The following papers have been read :—

Tuesday, October 18th, 1887. Introductory Address, by Mr. WILLIAM JACKSON, Chairman.

Tuesday, November 15th, 1887. "*The endings of some of Shakespeare's Tragedies*," by Mr. A. H. PAGET.

Tuesday, December 20th, 1887. "*Letters from the Dead*," by Mr. C. J. BILLSON, M.A.

Tuesday, January 17th, 1888. "*Bimetallism*," by Mr. W. SIMPSON, Jun.

Tuesday, February 21st, 1888. "*W. S. Landor*," by the Rev. A. P. DAWSON, M.A.

Tuesday, March 20th, 1888. "*Sartor Resartus*," by Mr. J. D. PAUL, F.G.S.

At the last meeting, Mr. A. H. PAGET was elected Chairman, and Mr. JOHN SCAMPTON, Secretary for the ensuing Session.

WM. JACKSON, *Chairman.*

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REPORT OF SECTION "C."

FOR GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—Mr. C. A. MOORE, M.D., New Walk Gates.

Secretary—Mr. A. F. ATKINS, London Road.

Members.	*Sectional Associates.*
ANDERSON, J. S.	BROWN
BATES, E. F.	QUILTER, H. E.
DRAPER, A. T.	
FRANKS, W. S., F.R.A.S.	
PAUL, J. D., F.G.S.	
VICE, W. A., M.B.	
WIKE, C. F.	
WALTERS, J. T.	

This Section has held five meetings during the past Session.

The following papers have been read :—

Thursday, November 10th, 1887. "*The Aylestone Sandpit, and its position with respect to the Soar Valley*," by C. A. MOORE.

Thursday, January 12th, 1888. "*Fossil Foraminifera*," with Specimens, by H. E. QUILTER.

Thursday, March 8th, 1888. "*Holiday rambles round Gilsland, Cumberland*, by J. D. PAUL, F.G.S.

Thursday, May 10th, 1888. Discussion on "*The origin of Coral Reefs.*"

C. A. MOORE, *Chairman.*

REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY & BOTANY).

Roll of Members and Sectional Associates.

Chairman—H. TOMKINS, M.D., The Fosse, Leicester.

Secretary—C. W. COOPER, M.B., King Street, Leicester.

Members.	*Sectional Associates.*
BARFOOT, W.	ADDERLEY, MISS
BILLSON, C. J., M.A.	BATES, F.
CARTER, T., LL.B.	BATES, E. F.
COOPER, E. F., F.L.S.	BOLUS, MISS
FINCH, J. E. M., M.D.	GRUNDY, MISS
GARNAR, J. H.	HEADLY, C. B.
GRUNDY, W. E.	KNOWLES, J. W.
MOTT, F. T. F.R.G.S.	MOTT, MRS.
OVERTON, R.	NOBLE, MISS M.
PRESTON, REV. T. A., M.A.	PALMER, J.
THORP, J. T.	QUILTER, H E.
TURNER, C. G.	SHENTON, MISS
VICE, W. A., M.B.	SLOANE, MISS
WATCHORN, T.	
WIKE, C. F.	

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Members, 30; viz. :—Members of the Society, 17; non-members, 13.
Evening Meetings:—The third Wednesday in each month, at 7 p.m., at the Museum.
Field Days:—The second Wednesday in each summer month, at 3 to 4 p.m.

The Section has held ten Meetings during the past year. The attendance has varied from six to thirteen, the average being ten.

The Section has lost by removal and resignation seven members, and two new ones have been elected, being a decrease of five for the year.

Three field meetings have been held during the year, viz: June—to Swannington Bog. July—to Wistow. May—to Narbro' Bogs.

Nine short papers have been read and discussed at the evening meetings of the Section, viz. :

June 15, 1887. "*Carduus tuberosus, a rare British Thistle,*" by the Rev. T. A. PRESTON, M.A.

July 20. "*The active principle of some poisonous British Plants,*" by the CHAIRMAN.

September 21. "*The Songs of some Leicestershire Birds,*" by Mr. F. T. MOTT, F.R.G.S.

November 16. "*Some recent observations on the Blood Cells,*" by Mr. H. E. QUILTER.

January 25, 1888. "*Improved Methods of examining and estimating the living organisms of the Atmosphere,*" by the CHAIRMAN.

February 15. "*The cause and limits of Organic Growth,*" by Mr. F. T. MOTT, F.R.G.S.

March 21. "*The Migration of Birds,*" by the CHAIRMAN.

April 18. "*The native Trees of Leicestershire,*" by Mr. F. T. MOTT, F.R.G.S.

May 16. "*Cheirognomy,*" by Mr. E. F. COOPER, F.L.S.

DISCUSSIONS.

The following subjects have been taken for discussion during the year, viz. :—

1. The zero temperature of Vegetation.
2. The best means of teaching Science in Schools.
3. The possibility of greatly increasing the vegetable produce from the soil.
4. Can birds vary the colour and markings of their eggs?

Brief reports of the Discussions, and the results of the Field-day Excursions will be found in the Quarterly Transactions of the Society.

HY. TOMKINS, *Chairman.*

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REPORT OF SECTION "E."

FOR ZOOLOGY.

Roll of Members and Sectional Associates.

Chairman—W. A. VICE, M.B., 5, Belvoir Street.

Secretary—F. R. ROWLEY, Town Museum.

Members.	*Sectional Associates.*
ANDERSON, J. S.	BARBER, MISS M.
BOND, C. J., F.R.C.S.	BROWNE, MONTAGU, F.Z.S.
BURCHNALL, W.	EVANS, W. A.
HARVEY, R., LL.B.	GRISWOLD, H. J.
MACAULAY, T., M.R.C.S.L.	HARVEY, R. WARDEN
PAUL, J. D., F.G.S.	HEADLY, B.
PAYNE, MISS	HOW, F. F.
POPE, F. M., B.A., M.D.	MACLACHLAN, G.
RICHMOND, E.	MATTHEWS, REV. A., M.A
RUST, A.	PALMER, G.
SQUIRES, MISS A.	PALMER, J.
WALKER, T.	QUILTER, H.E., M.C.S.
	SQUIRES, MISS
	STORER, G. H.

Since the last Report the Section has gained three new members, the total number being at present 28.

Twelve meetings have been held during the year, at which papers, often of considerable interest, have been read and discussed, and many objects of interest exhibited.

Only two field meetings were arranged during the past season, viz., one on the 11th June to Glenn Hall and grounds, at the kind invitation of Mr. THEO. WALKER, which was much enjoyed by those who took part in it, and another on the 9th of July to Bradgate Park, at which some interesting observations were made and specimens captured.

The following papers and short communications have been read at the evening meetings of the Section, viz.:

June 7, 1887. "*Notes on the Respiratory organs of various animals*," by the SECRETARY.

July 4. "*Notes on the parasite (Syngamus trachealis) causing the 'Gapes' in poultry, &c.*, by Mr. G. H. STORER; and a short paper on "*The Sphingidæ*," by the SECRETARY.

August 8. "*Newts and Salamanders*," by Mr. G. H. STORER.

September 5. "*The Hessian Fly in Leicestershire*," by Mr. H. E. QUILTER, M.C.S., with some remarks on *Cristatella mucedo*, by the SECRETARY.

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October 3. "*Bone*," by Mr. J. PALMER.

November 14. "*Natural History Jottings round Barmouth*," by Mr. F. F. How; and "*Notes on Volucella*," by the Chairman.

December 12. "*The Comparative Anatomy and Physiology of a Fresh-water Mussel*," by Mr. H. E. QUILTER, M.C.S.

January 16th, 1888. "*The Diurnal Lepidoptera of Leicestershire*," by the SECRETARY.

February 13. "*Notes on some Physiological Micro Slides brought for exhibition*," by the SECRETARY.

March 12. "*Some points in the Structure and Development of the teeth in the Rodentia*," by the CHAIRMAN.

April 9. "*Notes on the Natural History of the Natterjack Toad (Bufo calamita)*, by Mr. G. H. STORER.

W. A. VICE, *Chairman*.

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RULES OF THE LEICESTER

LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Object. The object of the Society shall be the general cultivation of Literature, Science, and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, a Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meetings, in conformity

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with Rule I. The discussion of theological or political questions, either by Lecturers or Speakers, is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any Member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately dsetroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Section, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next meeting of the Council, and submitted for election at a subsequent Meeting. All such elections shall be announced at the ordinary meeting of the Society next ensuing.

IX.

Subscription.

Each Member shall pay an annual subscription of one Guinea, which shall entitle him (1) to a member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII.

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s. 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors.

Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentleman resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations.

Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds.

After payment of the expenses of the Society, any surplus funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alteration of Rules.

No rule shall be made, rescinded, or altered, without the consent of two-thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-Laws, &c.

The Council shall have power to make By-laws and Regulations not inconsistent with the foregoing Rules.

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By-Laws

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council, on the 4th of November, 1887, adopted the following By-laws in the place of those then existing.

1.—Any Member or Associate of the Society may join any Section upon giving in his or her name to the Secretary of that Section, and paying to its funds an Annual Subscription of 1/-.

2.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2/6 to the funds of such Section.

3.—Each Section shall elect annually a Chairman and Secretary. The Chairman shall be a Member of the Society.

4.—For Sectional purposes the year shall terminate on the 31st of May, and the Annual Election of Officers by each Section shall take place at the Meeting of the Section next preceding that date. Casual vacancies shall be filled up as they occur by the Sections respectively. All elections of Sectional Officers shall be reported to the next ensuing meeting of the Council.

5.—Each Section shall, on or before the first Friday in March, June, September, and December, present to the Council a Quarterly Report of its Transactions and a Statement of the Meetings to be held during the ensuing quarter, which, subject to the approval of the Council, shall be published in the Quarterly Transactions of the Society. Each Section shall, if practicable, at the same time present to the Council at least one paper *in extenso* read before that Section, and the Council may direct that any such paper shall be printed in the Quarterly Transactions of the Society, with all necessary illustrations, in such form and manner as the Chairman of the Section shall recommend.

6.—The Quarterly Report of each Section, presented on or before the first Friday in June and published in the July number of the Transactions, shall be made up to the 31st of May, and shall contain in addition to the Quarterly Transactions of the Sections, the Roll of Members, the names of the Officers of the past year, and of those elected for the ensuing year, and an abstract of the work of the Section during the past twelve months.

7.—The Council may, on the application of any Section, make grants of money for any object connected with the work of the Sections.

8.—Any six Members or Associates of the Society who desire the establishment of a new Section, may memorialize the Council to that effect, but no Section shall be established without the consent of the Council.

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ANNUAL REPORTS

OF THE

LEICESTER

Literary and Philosophical Society.

FIFTY-FOURTH SESSION,

1888-89.

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OFFICERS OF THE SOCIETY FOR THE PAST SESSION, 1888-89.

President:

REV. A. P. DAWSON, M.A.

Vice-Presidents:

REV. E. ATKINS, B.Sc.
F. T. MOTT, F.R.G.S.
A. H. PAGET.
GEORGE STEVENSON.

Council:

Retiring June, 1889.	Retiring June, 1890.
H. BILLSON.	R. HARVEY, LL.B.
E. F. COOPER, F.L.S.	C. W. COOPER, M.B.
T. CARTER, LL.B.	W. KELLY, F.S.A., F.R.H.S.
J. E. M. FINCH, M.D.	T. C. LEE.
G. B. FRANKLIN.	J. H. GARNAR.
J. M. GIMSON.	E. CLEPHAN.
W. JACKSON.	W. KEMPSON.
C. A. MOORE, M.D.	F. M. POPE, M.B.
J. D. PAUL, F.G.S.	J. J. W. KNOWLES.
JAMES PLANT, F.G.S.	H. ELLIS.
HENRY TOMKINS, M.D.	REV. T. A. PRESTON, M.A.
W. A. VICE, M.B.	C. F. WIKE.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION.

President:

J. D. PAUL, Esq., F.G.S.

Vice-Presidents.

REV. E. ATKINS, B.Sc.
REV. A. P. DAWSON, M.A.
F. T. MOTT, F.R.G.S.
GEORGE STEVENSON.

Council:

Retiring June, 1890.	Retiring June, 1891.
R. HARVEY, LL.B.	H. BILLSON.
C. W. COOPER, M.B.	E. F. COOPER, F.L.S.
W. KELLY, F.S.A., F.R.H.S.	T. CARTER, LL.B.
T. C. LEE.	J. E. M. FINCH, M.D.
E. CLEPHAN.	G. B. FRANKLIN.
W. KEMPSON.	J. M. GIMSON.
F. M. POPE, M.B.	W. JACKSON.
J. J. W. KNOWLES.	C. A. MOORE, M.D.
HERBERT ELLIS.	A. H. PAGET.
REV. T. A. PRESTON, M.A.	JAMES PLANT, F.G.S.
C. F. WIKE.	HENRY TOMKINS, M.D.
C. J. BOND, F.R.C.S.	W. A. VICE, M.B.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Minute „ W. SIMPSON.
Financial „ GEORGE HULL.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:

Under the old Deed of Transfer from the Society.

THOSE ONLY ARE QUALIFIED TO ACT WHO REMAIN MEMBERS OF THE SOCIETY.

A. PAGET. | S. S. BANKART.

TOWN COUNCIL COMMITTEE:

Ten Members of the Council.

ALD. KEMPSON, CHAIRMAN.	MR. BURGESS.
E. WOOD, MAYOR.	MR. COLLIN.
Ex-Officio.	MR. ELSE.
ALD. ALMOND.	MR. FRANKLIN.
ALD. ANDERSON.	MR. MOTT.
ALD. BENNETT.	ALD. PAGET.

Six Gentlemen not Members of the Council.

C. BAKER.	A. H. PAGET.
H. BILLSON.	J. D. PAUL, F.C.S.
E. F. COOPER, F.L.S.	A. RUST.

HONORARY CURATORS:

ALD. KEMPSON.	A. H. PAGET.
J. D. PAUL, F.G.S.	H. BILLSON.
ALD. PAGET.	A. RUST.

CURATOR:

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Adderly, Alfred 1873
Allen, Charles Gordon 1886
Almond, Thomas 1870
Anderson, John Stafford .. 1874
Atkins, Arthur Frederick .. 1878
Atkins, Rev. Edward, B.Sc. .. 1876
Baines, Alexander 1874
Baines, William .. ..
Baker, Charles 1861
Barfoot, William 1874
Barlow, Arthur Edward, M.D. 1888
Bate, J. Stringer 1886
Bates, William Henry 1862
Bennett, John 1870
Billson, Chas. James, M.A. .. 1883
Billson, Henry 1871
Billson, William 1852
Blunt, Thomas, M.D. 1885
Bond, Charles James, F.R.C.S. 1887
Bramley, William Forrester .. 1868
Brierly, Jas. L. 1880
Brown, Henry 1886
Burchnall, William 1877
Burdett, Fergus.. 1888
Burford, Samuel Francis .. 1884
Burton, John Wiliam 1874
Carnley, Samuel Birch.. .. 1879
Carter, Thomas, LL.B. .. 1872
Catlow, George Spawton .. 1883
Challis, Francis James.. .. 1877
Chamberlain, Lionel Percy .. 1875
Chattaway, John Gordon .. 1880
Clarke, John Webster 1870
Clarke, Samuel 1850
Clements, R. Newton 1885
Clephan, Edwin.. 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A. .. 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cooper, Chas. Wm., M.D. .. 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cowan, George 1871
Crofts, John Ephraim 1880
Davis, John Henry 1886
Davis, Samuel 1871
Davis, Samuel *(Hinckley)* .. 1884
Dawson, Rev. Ambrose Pudsey, M.A. 1878
Deakin, John 1874
Donisthorpe, Hamilton.. .. 1886
Draper, Arthur Thomas .. 1879
Elgood, George Samuel.. .. 1887
Elgood, Thomas Scott 1885
Ellery, Henry George 1886
Ellis, Edward Ernest 1879
Ellis, Mrs. E. S. 1886
Ellis, Frederick 1881
Ellis, George Henry 1870
Ellis, Herbert 1886
Ellis, Mrs. James 1886
Ellis, Mrs. J. H. 1886
Ellis, Wilfrid Henry 1885
Else, Alfred 1860
Else, Miss Mary Elizabeth .. 1887
Elton, Joseph William.. .. 1875
Evans, Arthur 1881
Evans, Thomas Merritt .. 1859
Evans, William 1858
Everard, John Breedon.. .. 1870
Ewing, Joseph *(deceased)* .. 1871
Finch, John, E. Montagu, M.D. 1870
Fleming, Josiah.. 1880
Forsyth, Rev. P. 1888
Fortescue, Rev. Hugh John, M.A. 1877
Franklin, George Barton .. 1849
Froane, James 1870
Garnar, John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George.. 1878
Gibbs, Arthur W. 1886
Gimson, Arthur James.. .. 1879
Gimson, Josiah 1887
Gimson, J. Mentor 1872
Gimson, Sydney Ansell .. 1883
Gittins, Miss Edith 1886
Goddard, Miss E. A. 1886
Goddard, Joseph 1878
Gordon, Joseph 1881
Goward, Rowland Sydney .. 1883
Green, George 1870
Green, James 1879
Grimsdick, George J. 1886
Grundy, Walter Edward .. 1873
Gunn, Thomas James 1874

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Hack, Matthew 1860
Hames, Joseph 1844
Hardy, Arthur 1880
Harper, George Povey, M.A. .. 1885
Harris, Joseph 1862
Hart, Israel 1885
Harvey, Joseph 1870
Harvey, Robert, LL.B. .. 1877
Hawkes, James 1883
Hayes, Miss Elizabeth A. .. 1887
Hewitt, Francis.. 1862
Hibbert, George Radford .. 1882
Higgins, William Henry, M.B. 1883
Higgs, Alfred, M.D. 1883
Hitchcock, James William .. 1877
Hobson, William Stephen .. 1876
Hodges, Frank Henry 1885
Hodges, George Henry.. .. 1860
Hodges, John Edward 1860
Hopps, Rev. John Page .. 1876
Howcutt, Miss 1887
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Robert 1865
Hunt, Mrs. William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jackson, William 1863
Jacques, Edwin.. 1873
Johnson, Mrs. Payne 1886
Johnson, Thomas Fielding .. 1852
Johnson, Thomas Fielding, jun. 1880
Jones, George Howell 1874
Jones, Thomas 1884
Kelly, Wm., F.R.H.S., F.S.A. 1837
Kempson, William 1849
Kilby, Edwin Charles 1885
Kirby, George Langford .. 1884
Kirby, John 1872
Lawrence, Joseph Charles .. 1876
Lawford, James.. 1872
Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Lee, John Sutton *(deceased)* .. 1873
Leicester, Miss Ellen 1886
Lewis, Rev. Martin Luther .. 1888
Livens, Frederick 1874
Lockhart, Philip H. 1886
Loseby, Edward Thomas .. 1878
Lovell, John J. 1879
Maxfield, Matthew .. ..
McCall, John Henry 1886
Milne, John 1883
Moore, Chas. Arthur, M.D. .. 1883
Moore, Frank 1884
Moore, Percy 1887
Mott, Frederick Thompson, F.R.G.S. 1849
Newby, William Thomas .. 1873
Noble, Miss 1888
Oldershaw, Christopher .. 1885
Overton, Robert.. 1885
Packe, Charles, F.L.S. *(Stretton Magna)* 1874
Packe, Hussey *(Prestwold)* .. 1879
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Pattison, Ernest 1887
Paul, John Dennis, F.G.S. .. 1877
Payne, George 1879
Pegg, Abraham 1873
Pegg, Charles 1886
Pegg, John 1879
Pickard, Ezra 1885
Pickard, James Eastwood .. 1885
Pilgrim, John Thomas.. .. 1863
Plant, Horace Walter . .. 1874
Plant, James, F.G.S. 1866
Poclin, Robert 1885
Pollard, William Gamble .. 1885
Pope, Frank Montagu, M.D. .. 1885
Pratt, Reginald, M.D. 1887
Preston, Rev. Thomas Arthur, M.A. *(Thurcaston)* 1885
Ranson, George 1875
Raven, William.. 1886
Richardson, John George Frederick 1886
Richmond, Edmund 1874
Roberts, Joseph Drayton .. 1879
Roberts, Thomas 1880
Robinson, Charles Stephen .. 1879
Roehling, H. Alfred 1888
Roper, Joseph 1870
Rose, George John 1886
Rowlett, William Tertius .. 1885
Royce, David C., jun. 1881
Russell, Herbert.. 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of 1888
Sarson, John Edward 1880
Scampton, John.. 1870
Sculthorpe, William 1886
Shaw, Mrs. Lucy 1887
Simmons, James 1885
Simpson, J. Woodhouse .. 1886
Simpson, L., ... 1889
Simpson, William 1877
Sloane, John, M.D. 1883
Spencer, Charles Alfred .. 1884
Spencer, William 1883
Squires, Miss Augusta 1887
Stafford, John 1852
Stafford, John Thomas.. .. 1877
Stanyon, William 1874
Stevenson, George 1844
Stevenson, George Frederick .. 1883

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Stretton, Clement 1850
Stretton, Clement Edwin, C.E. 1886
Swain, Robert Paddy 1879
Tait, James 1873
Taylor, Thomas Smithies .. 1886
Taylor, William.. 1886
Thompson, William Thomas .. 1881
Thorp, John T. 1870
Tindall, William Henry .. 1888
Toller, Richard 1835
Toller, Richard Seddon .. 1886
Tomkins, Henry, M.D. .. 1885
Toone, Joseph 1879
Turner, William Henry .. 1881
Vaughan, Rev. David J., M.A. 1860
Viccars, George Herbert .. 1878
Viccars, William Purden .. 1885
Vice, John Henry 1885
Vice, William Armston.. .. 1880
Vipan, James Vipan 1885
Walker, Theodore 1869
Wand, Stephen 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Wartnaby, John Wade.. .. 1876
Wates, Benjamin Cunningham 1877
Went, Rev. James, M.A. .. 1877
Whitehead, Henry 1872
Whitmore, Walter 1883
Wilby, Mrs. 1888
Willcox, Samuel 1879
Williams, John Heath 1854
Wilson, Alfred Widnell .. 1882
Winterton, William 1854
Winterton, William Henry .. 1879
Wooding, George 1872
Woolston, Richard 1871
Wright, Thomas 1886
Wright, William 1881
Wykes, Alfred 1878
Wykes, Arthur Bond 1885

ASSOCIATES.

Atkins, William *(Market Harboro')* 1887
Cartwright, Mrs. James .. 1876
Chamberlain, Mrs. 1876
Charters, Mrs. Robert 1887
Cooper, Miss 1887
Edge, Miss 1888
Ellis, B. 1888
Froane, Miss H... 1876
Fuller, Cecil Charles 1887
Goadby, Mrs. 1880
Green, Miss 1883
Haymes, Mrs. 1874
Herne, F. S. 1888
Hottinger, Miss.. 1874
Jarvis, Miss 1887
Jones, Miss Rose Evelyn .. 1886
Lewitt, Miss A... 1877
Lilley, Samuel John 1887
Payne, Miss Caroline Edith .. 1882
Payne, Miss Eva 1882
Plant, Mrs. Nathaniel 1887
Smith, Miss 1884
Steads, Miss Angela 1885
Toller, Mrs. George 1887
Viccars, Mrs. George. 1887

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HONORARY MEMBERS.

G. A. K. Wilkes, M.D. ..
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham* .. 1847
John Lawrence, *Elton, Peterborough* .. 1843
C. Liddell, C.E., *London* .. 1848
John Smeeton, *London* ..
C. Roach Smith, F.S.A., *Strood, Kent* .. 1853
John Rae, M.D., LL.D., *Hudson's Bay House London* .. 1854
Major General The Hon. Leicester Smythe, C.B. (formerly Curzon) .. 1855
James Hemming Webb, *Melbourne Victoria* .. 1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London* .. 1861
Walter H. Bates, *London* .. 1861
John Halford, *Cape of Good Hope* .. 1866
Rev. R. Harley, F.R.S.,. FR.A.S., *4, Wellington Square, Oxford* .. 1874
Rev. C. C. Coe, F.R.G.S., *Bolton* .. 1874
Rev. J. Spittal, A.M., *Haywood Rectory Manchester* .. 1874
Rev. A. MacKennal, B.A., *Bowden, Manchester* .. 1877
Rev. W. Romains, M.A., *Wigston* .. 1879
Rev. J. P. O. Tomkins, B.A., *Kilby, Leicestershire* .. 1885
Alfred Paget, J.P., *Leicester* .. 1887
George Shaw, M.D., *Leicester (deceased)* .. 1887

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Report of the Council.

THE present Annual Report of the Council records the proceedings of the Society during its FIFTY-FOURTH Session.

ROLL OF MEMBERS.

Subscribing Members, 1887-88		271	
Lost by Death	3		
„ Removal	9		
„ Resignation	19—31		
New Elections during the Session—Gentlemen ...	7—240		
„ „ „ Ladies ...	2	9	
Subscribing Members, 1888-89			249
Associates, 1887-88	25		
Lost by Death	0		
„ Removal	0		
„ Resignation	3—22		
New Elections during the Session	3		
Associates, 1888-89			25
Total Subscribing Members and Associates 1888-89 ...			274
Honorary Members, 1888-89			20
Total			294

WORK OF THE SESSION.

Twelve General Meetings of the Society have been held during the Session, at which six professional and six non-professional Lectures have been delivered. The average attendance of Members and their friends at the professional Lectures has been 269; at the non-professional Lectures, 205. The average attendance at all the Lectures of the Session has been 237.

The Programme of the General Meetings was as follows:—

1888.
Oct. 8.—PRESIDENT'S ADDRESS. "Oliver Wendell Holmes."

„ 22.—Professor WILLIAM KNIGHT (St. Andrew's University). "The Classification of the Sciences."

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1888.

Nov. 5.—Rev. T. A. PRESTON, M.A. "The Potato."

,, 19.—Rev. Canon AINGER, M.A. "Wordsworth and Coleridge's Lyrical Ballads, 1798."

Dec. 3.—C. J. BILLSON, Esq., M.A. "Matthew Arnold."

,, 17.—Rev. W. H. DALLINGER, LL.D., F.R.S. "Contrasts in Nature: the Infinitely Great, and the Infinitely Little." (Illustrated by Transparencies drawn from Nature.)

1889.

Jan. 7.—Rev. J. P. O. TOMPKINS, B.A. "Wordsworth as a Teacher."

,, 21.—M. L. LEWIS, Esq., M.A., LL.M. "Robinson Crusoe."

Feb. 4.—Professor HENRY MORLEY. "The Right Reading of Books."

,, 18.—H. J. MACKINDER, Esq., (Reader in Geography in the University of Oxford). "Geography *and* Geography."

Mar. 4.—Captain W. DE W. ABNEY, C.B., F.R.S. "Colour Measures." (Illustrated with Experiments.)

,, 18.—G. H. NELSON, Esq., M.A. "John Ziska."

THE SECTIONS.

The Quarterly Reports of the Sections show that most of them are continuing to do good work, and they have all contributed papers to the Transactions. Among these may be specially mentioned the valuable illustrated essays on "Evidences of the Antiquity of Man in Leicestershire," by Mr. MONTAGU BROWNE, F.Z.S., and on "Fruits," by the Rev. T. A. PRESTON, M.A., which appeared in the October and April numbers of the Transactions. The Council desire to record their gratitude to Mr. F. BATES for the two very handsome gifts which he has made to the Society for the special use of Section "D." Last autumn he gave 100 microscopic slides of British Diatoms from Norfolk, all named and arranged in four cases, and at the end of the year he made another valuable present, the great work of Saville Kent, on the "Infusoria" and Hudson and Gosse's "Rotifera," in all five large volumes with numerous coloured plates, handsomely bound; also two boxes, containing 12 dozens of microscopic slides of vegetable sections, spores, etc. The Council regret that Section "C." (Geology) has been obliged to follow the example of Section "B." and ask the Council to terminate its existence. They have, however, made arrangements for the amalgamation of Section C with Section E, so that the opportunity for organized study of Geology may not be lost.

THE TRANSACTIONS.

Four Numbers of the New Quarterly Series of Transactions have been published during the past Session.

ACCOMMODATION OF THE SOCIETY.

Your Council, in accordance with the promise which they gave in last year's report, have again given their attention to this subject. Last November a deputation from your Council was appointed to wait upon

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the Museum Committee of the Town Council to ask whether they would be prepared to recommend the Town Council to erect additional rooms to the Museum Buildings in accordance with plans which had been prepared for the Society by Mr. Charles Baker, at an estimated cost of £675, on condition that the Society contributes £200 towards the cost and provides for the upper room (which room is to be reserved for the exclusive use of the Society) the necessary fittings at an estimated cost of £100. This proposal is still under the consideration of the Museum Committee.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

The Twelfth Annual Meeting of the Union has been fixed to take place at Oxford.

THE ROMAN PAVEMENT.

Your Council wish to call the attention of Members and Associates to the admirable Chromo-Lithograph of the Roman Pavement in Jewry Wall Street, which was executed by the direction of the Council. A few copies can still be obtained at the Museum at the price of Half-a-crown each.

OBITUARY.

In the report of last year your Council had to lament the loss of Mr. William Napier Reeve, and this year another link with the past has been broken by the death of Dr. Shaw, one of the two original founders of the Society. On the seventh of September, 1835, Dr. Shaw delivered his Inaugural Address as its first President, and on the sixth of October, 1884, in the fiftieth year of its existence, the Society had the rare good fortune to hear from the same lips a review of its past life, and of the general progress of the half-century. This Address was published in the following year, and the preface with which Dr. Shaw then introduced it, ended with the following words: "At my advanced age I can hardly expect to witness for any lengthened period, the further progress and development of our Society; but I can express the earnest and confident hope that, as from such small beginnings it is now able to present itself in such vigorous manhood, so it may continue to strive, as hitherto, to advance in every way the pursuit of those great objects for which it was founded, and thus fulfil its mission to promote the social, moral, and intellectual welfare of the people of our old town of Leicester." These are the last words which Dr. Shaw left to our Society, and it can pay no more fitting tribute to his memory than the endeavour to carry out this programme of its first President.

NEW PRESIDENT.

The Council have unanimously elected John D. Paul, Esq., F.G.S., as President for the ensuing Session.

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LEICESTER LITERARY AND PHILOSOPHICAL SOCIETY.

Statement of Accounts.—Session 1888-1889.

Dr. *RECEIPTS.*

	£ s. d.	£ s. d.
To Balance in Treasurer's hands—		
General Fund	21 1 9	
Boulder Fund	4 0 0	
		25 1 9
,, Members' Subscriptions		258 16 6
,, Associates' ,, ...		13 2 6
,, Payments for Copies of "Flora of Leicestershire"		3 7 9
,, Sale of Tickets for Excursion to Gracedieu, &c...		6 6 0
,, Sale of Chromo-Lithographs of Roman Pavement		1 12 6
,, Sale of Quarterly Transactions		0 15 6
		£309 2 6

PAYMENTS. *Cr.*

	£ s. d.	£ s. d.
By Rent of Rooms at Museum		75 0 0
,, Expenses connected with Lectures at the Society's Meetings—		
Lecturers' Fees	80 8 0	
Incidentals connected with Lectures ..	4 2 6	
		84 10 6
,, Subscriptions—		
Midland Union of Natural Hist. Societies	3 7 9	
Scottish Meteorological Society	0 10 6	
Year Book of Societies	0 7 6	
		4 5 9
,, Printing and Stationery		60 6 6
,, Advertising		8 18 0
,, President's Portraits		9 9 0
,, Expenses connected with Excursion to Gracedieu, &c.		9 7 6
,, Chromos of Roman Pavement		17 0 0
,, Collotypes		9 0 0
,, Collecting Subscriptions		6 6 0
,, John Biggs, gratuity		4 4 0
,, Miscellaneous Expenses		11 12 6
,, Balance in Treasurer's hands--		
General Fund	5 2 9	
Boulder Fund	4 0 0	
		9 2 9
		£309 2 6

Examined and found correct, June 24th, 1889 { E. CLEPHAN, T. C. LEE.

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Officers of the Sections.—1888-89.

—:o:—

SECTION "A." ... ... MR. ALFRED H. PAGET, CHAIRMAN.
West Walk.

MR. JOHN SCAMPTON, SECRETARY.
1, Pelham Street, Welford Road.

SECTION "C." ... ... MR. C. A. MOORE, M.D., CHAIRMAN.
New Walk Gates.

MR. LOUIS HODGES, SECRETARY.
St. Martin's Schools.

SECTION "D." ... ... MR. F. T. MOTT, F.R.G.S., CHAIRMAN.
Birstall Hill.

MR. J. W. KNOWLES, SECRETARY.
25, St. Stephen's Road.

SECTION "E." ... ... MR. F. M POPE, CHAIRMAN.
Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY.
Town Museum

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Officers of the Sections—1889-90.

———:o:———

SECTION "A." ... ... MR. T. CARTER, LL.B, CHAIRMAN
London Road.

MR. JOHN SCAMPTON, SECRETARY
1, Pelham Street, Welford Road.

SECTION "D." ... ... MR. F. T. MOTT, F.R.G.S., CHAIRMAN
Birstal Hill.

MR. J. J. W. KNOWLES, SECRETARY,
25, St. Stephen's Road.

SECTION "E." ... ... MR. F. M. POPE, M.B., CHAIRMAN,
Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY,
Town Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—MR. A. H. PAGET, West Walk.

Secretary—MR. JOHN SCAMPTON, 1, Pelham Street.

Members.

BAKER, C.
BILLSON, C. J., M.A.
BRODIE, J. D.
BURDETT, E.
CARTER, T., LL.B.
COOPER, C. J
DAWSON, REV. A. P., M.A.
FRANKLIN, G. B.
GARNAR, J. H.
GIMSON, J. M.
HARPER, G. P., M.A.
HARVEY, R., LL.B.
HARVEY, J.
HEARNE F.S.
ISLIP, MRS.
JACKSON, WM.
JONES THOS.
KELLY, W., F.S.A.
LEWIS, M.L., M.A.
LEE, T. C.
MOTT, F. T., F.R.G.S.

Members (continued).

MOORE, A.P., M.A.
PAGET, A. H.
PAUL, J. D., F.G.S.
ROLLESTON, A. F.
SIMPSON, WM.
STEVENSON, G. F.
TAYLOR, T. C.
TAYLOR, W.

Sectional Associates

BILLSON, MRS. C J.
BILLSON, MISS C.
DAWSON, MRS. A. P.
ELLIS, MISS H.
HARVEY, MRS. R.
HARPER, MRS. G. P.
HARPER-VERNON, MISS
HAYES, MISS
SQUIRES, MISS A.
STANYON, MISS L.

There have been five Meetings of the Section held, with an average attendance of ten members.

The names of Mr. G. B. FRANKLIN, Mr. A. P. MOORE, M.A., Mr. F. S. HEARNE, Mr. E. BURDETT, and Miss HAYES have been added to the list of members of the Section.

Papers read—

October 16th, 1888. The Chairman opened the Session by reading a Paper on "*The Beaumonts of Gracedieu.*"

Nov. 20th, 1888. Mr. WM. JACKSON read a Paper on "*Sartor Resartus.*"

Jan. 15th, 1889. Mr. A. P. MOORE, M.A., "*Characters and Character Drawing.*"

Feb. 19th, 1889. Mr. C. J. BILLSON, M.A., "*Robert Louis Stevenson.*"

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March 19th, 1889. Mr. G. B. FRANKLIN, "*Florence.*"

Mr. THOS. CARTER, LL.B., was elected Chairman of the Section for the ensuing Session, and Mr. JNO. SCAMPTON was re-elected Secretary.

A. H. PAGET, *Chairman.*

REPORT OF SECTION "C."

FOR GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—MR. C. A. MOORE, M.D. New Walk Gates.

Secretary—MR. L. HODGES, 21, Garendon Street.

Members.	*Sectional Members.*
ATKINS, A. F.	BROWN, T.
BATES, E. F.	HODGES, L.
CLEMENTS, DR.	QUILTER, H. E.
DRAPER, A. T.	
PAUL, J. D.	
VICE, C. F.	
WALTERS, J. T.	

This Section has held only two Meetings during the past Session, with an average attendance of six members and associates.

At a Meeting held in June, 1888, it was decided—rather than that the Section should fall through—to carry it on *principally* for the purpose of registering practical work done. It was also decided that an attempt should be made to hold quarterly meetings, unless special circumstances arose for holding them more frequently. Owing, however, to the difficulty of obtaining readers of papers, and to the general lack of interest shown, it has been found impossible to carry out even the quarterly meetings. At the Annual Meeting, held May 16th, 1889, no officers were elected, and the Secretary was requested to write to the Hon. Secretary of the Society and explain the position of the Section.

The following paper has been read:—

Wednesday, Feb. 13, 1889. "*The Rhætic Beds of Leicestershire, with Notes on some Remains of Fossil Fishes from the Rhætic Beds, by A. Smith Woodward, F.G.S., F.Z.S.*"—by Mr. H. E. QUILTER.

C. A. MOORE, *Chairman.*

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REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY & BOTANY).

Roll of Members and Sectional Associates.

Chairman—F. T. MOTT, Birstal Hill, Leicester.

Secretary—J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

Members.	*Sectional Associates.*
BARFOOT, W.	ADDERLY, MISS
BILLSON, C. J., M.A.	AGAR, REV. W.
BURFORD, S.	ANDERSON, MISS
CARTER, T., LL.B.	BATES, F.
COOPER, E. F., F.L.S.	BOLUS, MISS
COOPER, C., M.B.	BOUSKILL, F.
FINCH, J. E. M., M.D.	ELLIOTT, O. T.
GARNAR, J. H.	GRUNDY, MISS
GRUNDY, W. E.	HEADLEY, C. B.
OVERTON, R.	MOTT, MRS.
PRESTON, REV. T. A., M.A.	NOBLE, MISS M.
THORP, J. T.	PALMER, J.
TOMKINS, H., M.D.	QUILTER, H. E.
TURNER, C. G.	SHENTON, S.
VICE, W. A., M.B.	STORER, G. H.
	WATCHORN, T.

Members, 33 ; viz. :—Members of the Society 17 ; non-members, 16.

Evening Meetings :—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days :—The second Wednesday in each summer month, at 3 to 4 p.m.

The Section has held eleven meetings during the past year. The attendance has varied from 5 to 16, the average being eleven.

The Section has lost by removal and resignation three members, and six new ones have been elected, being an increase of three for the year.

Four field meetings have been held during the year, viz. :

June—To Swithland Wood, when the members were very hospitably entertained by Rev. T. A. PRESTON at Thurcaston Rectory.

July—To Gracedieu, &c., in connection with the general excursion of the Society.

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September—To the village of Great Stretton on the Gartree Road, the ancient Roman *Via Devana.*

May, 1889.—To the Spinney Hill Park, and afterwards to the grounds of the Borough Asylum, where the members were handsomely entertained by Dr. Finch.

These half-day excursions always prove interesting and instructive; many items of biological knowledge are acquired by the members, even though no actual discoveries may be made.

Seven short papers have been read and discussed at the evening meetings, viz. :—

July 25, 1888, on "*Cultivation,*" by the CHAIRMAN.

Sept. 19, 1888, on "*The Parasitic Phanerogams of Leicestershire,*" by Mr. THOMAS CARTER, LL.B.

Nov. 21, 1888, on "*The Amphibians and Reptiles of Leicestershire,*" by the CHAIRMAN.

Dec. 19, 1888, on "*Fruits,*" by Rev. T. A. PRESTON, M.A.

Feb. 20, 1889, on "*The Ferns of Leicestershire,*" by the CHAIRMAN.

April 17, 1889, on "*The Native Bulbs of Leicestershire,*" by the CHAIRMAN.

May 15, 1889, on "*The Theories as to the Variations of Race in Mankind,*" by the HON. SECRETARY.

The following subjects have been introduced for formal discussion, two of them being followed at the succeeding meetings by written papers which grew out of the previous discussions, viz. :—1. The causes which produce the change of the caterpillar into the butterfly. 2. The phenomenon of growth in plants. 3. Amphibians and reptiles. 4. The causes of the varied colour of skin and hair in the different races of mankind.

A large number of interesting objects were exhibited at the various meetings. The Section continues to work with vigour and advantage, but its operations are much curtailed by the want of better accommodation. The room is much too small; the books of the Society are inaccessible because there are no shelves on which to place them; the microscopes are generally out of order for want of a lock-up cupboard.

Brief reports of the discussions, and the results of the field-day excursions will be found in the Quarterly Transactions of the Society.

F. T. MOTT, *Chairman.*

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REPORT OF SECTION "E."

FOR ZOOLOGY.

Roll of Members and Sectional Associates.

Chairman—F. M. POPE. M.D., Campbell House.

Secretary—F. R. ROWLEY, Town Museum.

Members.	*Sectional Associates.*
ANDERSON, J. S.	BARBER, MISS M.
BOND, C. J., F.R.C.S.	BOUSKELL, F.
BURCHNALL, W.	BROWNE, MONTAGU, F.Z.S.
HARVEY, R., LL.B.	DAVIES, J. T., M.D.
MACAULAY, T., M.R.C.S.L.	ELLIOTT, O. T.
PATTISON, E.	EVANS, W. A.
PAUL, J. D., F.G.S.	GRISWOLD, H. J.
PAYNE, MISS	HARVEY, R. WARDEN
RUST, A.	HEADLY, B.
SQUIRES, MISS A.	HOW, F. F.
VICE, W. A., M.B.	LLOYD, W. H.
WALKER, T.	MACLACHLAN, G.
	MATTHEWS, REV. A., M.A.
	PALMER, G.
	PYCRAFT, W. P.
	QUILTER, H. E., M.C.S.
	SQUIRES, MISS
	STORER, G. H.
	WARD, G.

The work of this Section has been steadily maintained during the past year, its position, both financially and otherwise, being increasingly satisfactory. Two members have unfortunately been lost by resignation, owing to their inability to attend the Sectional Meetings on account of removal and pressure of business respectively, but this circumstance has been counterbalanced by the addition of seven names to the list, bringing the total number at present on the roll up to 33.

With the exception of an excursion to Brooksby on August 11th, no regular field meetings have been held, though the exertions of individual members have in a great measure made up for this deficiency.

The following papers and short communications have been read at the evening meetings of the Section, viz. :—

June 11th, 1888. "*Some notes upon the remains of Cervidæ found in Leicestershire*," by Mr. MONTAGU BROWNE, F.Z.S. (Illustrated.)

July 2nd. "*Monophyletic and Polyphyletic Descent*," by Mr. H. E. QUILTER.

Sept. 24th. "*Evidences of the Antiquity of Man in Leicestershire*," by Mr. MONTAGU BROWNE, F.Z.S. (Illustrated.)

Oct. 15th. "*Animal Heat*," by the CHAIRMAN.

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Nov. 12th. "*Some Notes upon the Habits and Voices of our British Song Birds, with special reference to those found in Leicestershire,*" by Mr. G. H. STORER. (Illustrated.)

"*List of Recent and Fossil Amphibia and Reptilia found in the County,*" and "*The Black Tern (Hydrochelidon nigra) in Leicestershire,*" by Mr. MONTAGU BROWNE, F.Z.S.

Dec. 10th. "*The occurrence of Cetacean Remains in the County,*" by Mr. MONTAGU BROWNE, F.Z.S. (Illustrated.) "*Additions to the County List of Mollusca,*" by Mr. H. E. QUILTER. (Illustrated); and "*Note on Ixodes Erinaceus,*" by the SECRETARY. (Illustrated.)

Jan. 14th, 1889. "*The Life-histories of some Animal Parasites,*" by the SECRETARY. (Illustrated.)

Feb. 11th. "*Notes on the recent Immigration of Sand Grouse*" *(Syrrhaptes paradoxus),* by Mr. W. P. PYCRAFT. (Illustrated.)

March 11th. "*The Shell and Periostracum of the Mollusca,*" by Mr. H. E. QUILTER. (Illustrated.)

April 8th. "*The Halteres of the Diptera—their Structure and Function,*" by Mr. W. A. VICE, M.B. (Illustrated.)

F. M. POPE, *Chairman.*

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RULES OF THE LEICESTER

LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Objects. THE object of the Society shall be the general cultivation of Literature, Science, and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, a Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council, shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meeting, in conformity

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with Rule I. The discussion of theological or political questions, either by Lecturers or Speakers, is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any Member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately destroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Section, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next Meeting of the Council, and submitted for election at a subsequent Meeting. All such elections shall be announced at the ordinary Meeting of the Society next ensuing.

IX.

Subscription.

Each Member shall pay an annual subscription of one Guinea, which shall entitle him (1) to a Member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s. 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors. Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentleman resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations. Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds. After payment of the expenses of the Society, any surplus funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alteration of Rules. No Rule shall be made, rescinded, or altered, without the consent of two-thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-Laws, &c. The Council shall have power to make By-laws and Regulations not inconsistent with the foregoing Rules.

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By-Laws

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council on the 4th of November, 1887, adopted the following By-laws in the place of those then existing.

1.—Any Member or Associate of the Society may join any Section upon giving in his or her name to the Secretary of that Section, and paying to its funds an Annual Subscription of 1/-.

2.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2/6 to the funds of such Section.

3.—Each Section shall elect annually a Chairman and Secretary. The Chairman shall be a Member of the Society.

4.—For Sectional purposes the year shall terminate on the 31st of May, and the Annual Election of Officers by each Section shall take place at the Meeting of the Section next preceding that date. Casual vacancies shall be filled up as they occur by the Sections respectively. All Elections of Sectional Officers shall be reported to the next ensuing Meeting of the Council.

5.—Each Section shall, on or before the first Friday in March, June, September, and December, present to the Council a Quarterly Report of its Transactions and a Statement of the Meetings to be held during the ensuing quarter, which, subject to the approval of the Council, shall be published in the Quarterly Transactions of the Society. Each Section shall, if practicable, at the same time present to the Council at least one paper *in extenso* read before that Section, and the Council may direct that any such paper shall be printed in the Quarterly Transactions of the Society, with all necessary illustrations, in such form and manner as the Chairman of the Section shall recommend.

6.—The Quarterly Report of each Section, presented on or before the first Friday in June, and published in the July number of the Transactions, shall be made up to the 31st of May, and shall contain in addition to the Quarterly Transactions of the Sections, the Roll of Members, the names of the Officers of the past year, and of those elected for the ensuing year, and an abstract of the work of the Section during the past twelve months.

7.—The Council may, on the application of any Section, make grants of money for any object connected with the work of the Sections.

8.—Any Six Members or Associates of the Society who desire the establishment of a new Section, may memoralize the Council to that effect, but no Section shall be established without the consent of the Council.

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VOL. II.

PART I., OCTOBER, 1889.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
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CHARACTERS AND CHARACTER-DRAWING.

By A. Percival Moore, B.A. (Read before Section "A.")

The title of this Paper promises more than I am able to perform. I am not about to attempt any disquisition on the delineation of character in biography, from Plutarch to Trevelyan; in poetry, from Chaucer to Browning; or in the novel, from Defoe to George Eliot. On the contrary, my design is strictly limited, and my purpose is merely to say a few words about a class of books which, even in this age of reprints, are seldom edited, and which are not often to be met with even on second-hand bookstalls. Characters are short and witty descriptions of classes of men, and the art of writing such sketches is a form of composition which has long gone out of fashion. The fable and the proverb, though no longer issued from the mint, are still current coin, while character-sketches, such as the Characters of Sir Thomas Overbury and Bishop Earle, have not only ceased to be produced but are also passing out of circulation. Probably the best-known writings of this class in the English language are a few essays of Charles Lamb—"The Superannuated Man," "The Good Clerk," and "The Character of an Undertaker." These sketches are most excellent in their kind and quite after the old models, not only displaying Lamb's native humour but also much of that wit which is the peculiar excellence of character-writing. With the solitary exception of Charles Lamb, there has been no character-writer of note in this century. It is true there are books which purport to belong to this class, but they are for the most part as inferior from an artistic point of view to the writings of Overbury or Earle, as a Waterbury watch to a lantern-clock, or a photograph to a portrait of Sir Joshua Reynolds.

In the seventeenth and eighteenth centuries character-writers were numerous and their works popular. But the novelist has quite ousted the character-writer from his place in popular favour, and works of this class have been dismissed to "the old curiosity shop" of literature, and form no part of the mental furniture of the age. Still they possess considerable merit. The style in which they are written is vivid, picturesque, and epigrammatic, quite alien to the style of modern prose-writers. Indeed, few more wholesome exercises could be desired for the multo-scribbling novelist of to-day than the study of the Characters of Overbury and Earle, who use the labour of the file on every line and make every sentence an apothegm. These works are with epigrams the best examples in literature of the truth of Hesiod's paradoxical proverb that the half is more than the whole. They possess three rare qualities,

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called by that quaint old writer Howel, "sense, shortness, and salt." If some enchanter were to visit the library at the British Museum and reduce by a stroke of his wand every book on the shelves to its quintessence according to Addison's conceit, the characters of Theophrastus and his English imitators would lose as little of their original bulk as the thoughts of Pascal or the maxims of the Due de la Rochefoucault. They are in fact subtle irreducible analyses of character.

In the drama and the novel we see all sorts and conditions of men in action and movement with all the picturesque accessories of incident and circumstance. It is quite a different kind of art which aims at producing with a few strokes of the pen a finished portrait of a type of human nature. Literature is wide enough to embrace both kinds of art, and both have their value. Just as after strolling through a gallery of pictures it is pleasant to linger over a cabinet of old coins, so we may turn from the *magnum opus* of the dramatist to the sketch of the character-writer. Theophrastus is as indisputably the first and greatest of character-writers as Homer is of poets. It is singular that he has never attracted in England the same attention that he has met with on the Continent. There is barely one English commentator to a score of Germans who have exercised their ingenuity upon the corrupt text of his Characters, and the best English translation and commentary of his work that has ever appeared had a small sale and was soon out of print. Yet it is a unique work in ancient literature, and to it we may trace the origin of much that we should be sorry to lose in the literature of our own country. The work is in its form a catalogue of qualities, in the state in which it has come down to us very imperfect, and its interest for us consists in the skill with which the writer has drawn the characteristic traits by which a man exhibits these qualities in society. Its value is greatly enhanced by the loss of the work of the new comedy which would have told us so much about Athenian society and manners. In reading the book we cannot fail to be struck with the fact how little human nature has changed in more than two thousand years. Indeed the Greek author draws human nature in more catholic aspects, and his types of character are more universally recognisable than those of most of his imitators. No doubt this it due in a great measure to the simplicity of Greek life. In the more varied and complex civilization in which Earle, Butler, or La Bruyère lived and wrote there were abnormal and eccentric growths of character which had no prototypes at Athens and which are now extinct, but which supplied these writers with attractive material. The Royalist wits delighted to put the Puritan in the pillory and pelt him with ridicule. La Bruyère painted the noble, the courtier, and the divine of the time of Louis the XIV. The characters of Theophrastus are to be found in London and Paris, New York and Melbourne, as often as at the Athens of his own day.

The sketches of Theophrastus, as might be expected of the favourite pupil and successor of Aristotle, are founded on a philosophical analysis of character. Aristotle defined the virtue of social intercourse as a

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mean state between excess and defect, which was fixed by the intuitive sense of the καλοκαγαθος (the perfect gentleman), as to what is right and proper in the relations of a man to his fellows. So Lord Shaftesbury, the most Greek of English ethical writers, in that curious work, "The Characteristics of Men and Manners," says, "In the very nature of things there must of necessity be the foundation of a right and wrong taste as well in respect of inward character and feature as of outward person, behaviour, and action." Adopting Aristotle's standard of the proprieties of social life, Theophrastus took every opportunity of testing it by his experience of men. With this object in view, he works within certain definite limits. A character-writer cannot paint an Iago, and Theophrastus restricted himself in his choice of materials to characters which are all of them vicious, but none to such a revolting degree as to exclude an element of the ludicrous. He took as his province the comedy of manners, and delights to delineate those social blunders and gaucheries, peculiarities of dress, demeanour and style of living which transgress the impalpable line of good breeding and expose a man to the ridicule of his fellows. The Characters of Theophrastus are the Athenian Spectator. He paints the bore who is always talking about the weather and the crops; the miser who stops the price of a broken cup out of his servant's wages; the hypochondriac who is for ever grumbling about his health; the scented and clean-shaven dandy; the boor who talks in loud tones and wears shoes too big for him, with great nails in them; the absent man who mislays everything and makes answers off the point, and the old man of the Monsieur Jourdain type, who makes a fool of himself on horse-back and in the wrestling-school. We cannot but regret that there are no portraits of women in the gallery of Theophrastus. How grateful we should be for an Aspasia or even a Xanthippe drawn by his hand. In this he shows himself a philosopher, for Greek philosophers, and indeed Greek historians also, agree to ignore as far as possible the existence of the other sex.

Nor are there any virtuous characters in the book. With what skill he would have painted those little traits of manner and behaviour which render his great master's portrait of the great-souled man picturesque! For Aristotle did not disdain to complete his picture of the great-souled man by describing him as slow and stately in his movements, like a Castilian noble, and reserved and ironical in his manner to the common people, like the Coriolanus of Shakespeare. But virtuous characters appear to be excluded from the scope of his work, which seems rather designed to amuse than to instruct. It is true that in the preface he promises to produce a complete series of types of character good and bad, and if the preface be genuine the lack of virtuous characters may be most probably explained by the hypothesis that the author died before completing the work, as he declares himself to be 99 years of age at its commencement. Most critics, however, condemn the preface as spurious, and indeed the piquant and playful style in which the work is written contradicts the didactic purpose there expressed. Universal tradition

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attests the fact that, like Sophocles and Isaac Walton, he continued to to write in extreme old age, and he is reported to have died lamenting that death overtook a man at the very time when he was just beginning to get an insight into the problems of life. He was a great personage in his day, and the whole population of Athens is said to have formed his funeral procession. The satire of Theophrastus, like that of Horace, leaves no sting behind. It is as destitute of extravagance as of invective, and his portraits are unmistakably copied from life. His theme is the vulgarities and meannesses of a petty society, but the skill of his art, like that of the Dutch school of painting, renders that interesting and amusing in his portraits which wearies and disgusts in the original.

The Greek author has found numerous imitators, and has been translated into almost every European language.

Of his imitators, some draw mimetic, others satiric, sketches; some miniatures, others caricatures. La Bruyère occupies a class by himself. He plays the *rôle* of Jesus the Son of Sirach as well as the *rôle* of Theophrastus. He is a sage as well as an artist, and his work is as remarkable for sententious wisdom as for graphic skill. Between the years 1599 and 1700 there were more than fifty books of Characters published, most of them now known only to the curious. The earliest Characters worthy of notice, from a literary point of view, are the characters of the *dramatis personæ* prefixed to Ben Jonson's comedy, "Every Man out of his Humour." They are written with wit, elegance, and force, and are as perfect in their kind as the description of the company of pilgrims in the Prologue to "The Canterbury Tales." Take for instance the character of Fastidious Brisk, "a neat, spruce, affecting courtier, one that wears clothes well and in fashion, practiseth by his glass how to salute, speaks good remnants, notwithstanding the base-viol and tobacco, swears tersely and with variety, cares not what man's favour he belies, or great man's familiarity; a good property to perfume the boot of a coach—he will borrow another man's horse for praise and back him as his own—or for a need on foot can post himself into credit with his merchant only with the gingle of his spur and the jerk of his wand"; or the character of *Sogliardo*, "An essential clown, yet so enamour'd of the name of gentleman that he will have it tho' he buys it. He comes up every term to learn to take tobacco and see new motions. He is in his kingdom when he can get himself in company where he may be well laughed at." Could word-pictures be painted with more admirable force and brevity?

The two most famous character-writers in the English language are Sir Thomas Overbury, himself at one time of his life a friend of Ben Jonson, and Bishop Earle. These two writers not only possess the gift of keen discrimination of character, but also in a peculiar degree that kind of dry wit which perpetually surprises and delights the reader by quaint images and metaphors, and of which Fuller, the Church historian, and Sir Thomas Brown afford the most striking examples in English

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literature. No better definition can be given of the art of character-writing, as he understood it, than that given by Overbury himself. "To square out a character by our English level it is a picture (reall or personall) quaintly drawne in various colours, all of them heightned by one shadowing. It is a quicke and soft touch of many strings, all of them shutting up in one musicall close. It is wit's descant on any plain song."

A cursory glance at the titles of his characters shows how varied and motley an assemblage of persons he has gathered together. An ostler, a good wife, a chambermaid, an Innes of Court man, a button-maker of Amsterdam, a meere pettyfogger, a devillish usurer, a Jesuite, a covetous man, are a few taken at random. As an instance of his satirical vein I take his description of "an affectate traveller." "An affectate traveller is a speaking fashion; he hath taken pains to be ridiculous, and hath seen more than he hath perceived; his attire speaks French or Italian, and his gate cries, Behold me! he censures all things by countenances and shrugs, and speaks his own language with shame and lisping; he will choake rather than confesse beere good drinke, and his pick-tooth is a maine part of his behaviour; he chooseth rather to be counted a spie than not a politician, and maintains his reputation by naming great men familiarly; hee comes still from great personages, but goes with mean; hee takes occasion to shew jewels given him in regard of his virtue that were bought in St. Martine's, and not long after, having with a moun'e-bank's method pronounced them worth thousands, impawneth them for a few shillings. Upon festivall days he goes to court and salutes without re-saluting; at night in an ordinary he canvasseth the business in hand, and seems as conversant with all intents and plots as if he begot them." Still better is his character of 'a courtier," but it is too long for quotation. But the gem of the collection is his character of "the faire and happye milk-maid." Every one knows the allusion to it in Walton's "Angler," but every one has not read it. It is so perfect a unity that I cannot desecrate its beauty by cutting it into fragments, but must crave leave to read the whole of it. It is a good illustration of Overbury's definition of a character as a "quicke and soft touch of many strings all shutting up in one musicall close."

A Faire and Happy Milk-Maid.

Is a countrey wench, that is so farre from making herselfe beautiful by art, that one looke of hers is able to put *all face-physicke* out of countenance. She knowes a faire looke is but a dumbe orator to commend vertue, therefore mindes it not. All her excellencies stand in her silently, as if they had stolne upon her without her knowledge. The lining of her apparell (which is herself) is farre better than outsides *of tissew:* for though she be not arrayed in the spoile of the *silke-worme*, shee is deckt in *innocency*, a far better wearing. She doth not, with lying long abed, spoile both her *complexion* and *conditions;* nature hath taught her, too *immoderate sleepe is rust to the soule:* she rises therefore with *Chaunticleare*, her dames cock, and at night makes the *lamb* her *courfew*. In milking a cow, and straining the teats through her fingers, it seemes that so sweet a milk-presse makes the milk the whiter or sweeter; for never came *almond glove* or *aromatique*

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oyntment on her palme to taint it. The golden eares of corne fall and kisse her feet when shee reapes them, as if they wisht to be bound and led prisoners by the same hand that fell'd them. Her breath is her own, which sents all the yeare long of June, like a new made hay-cock. She makes her hand hard with labour, and her heart soft with pity: and when winter evenings fall early (sitting at her merry wheele) she sings a defiance to the giddy *wheele of fortune*. She doth all things with so sweet a grace, it seems *ignorance* will not suffer her to doe ill, being her mind is to doe well. She bestowes her yeares wages at next faire; and in choosing her garments, counts no bravery i' th' world, like decencie. The *garden* and *bee-hive* are all her *physick* and chyrurgery, and she lives the longer for't. She dares goe alone and unfold, and unfold sheep i' th' night, and feares no manner of ill, because she meanes none: yet to say truth, she is never alone, for she is still accompanied with old *songs*, *honest thoughts*, and *prayers*, but short ones; yet they have their efficiency, in that they are not pauled with insuing idle cogitations. Lastly her dreams are so chaste, that shee dare tell them; only a Fridaies dream is all her *superstition*: that shee conceales for feare of anger. Thus lives she, and all her care is she may die in the *spring-time*, to have store of flowers stucke upon her winding sheet.

I cannot believe that any more exquisite piece of prose exists in any language. There is not a jarring note in the symphony. The metaphors and images are perfectly attuned to the subject. Though the piece is finished with consummate art, it does not smell of the lamp, but is fragrant of fields and flowers.

It is as unapproachable for simplicity and dignity as the collects in the Book of Common Prayer. Placed by the side of more coarsely-drawn sketches in the book, it is as pre-eminent for life and grace as the Venus in the Louvre beside the statues that surround it.

For, taken as whole, Overbury's characters are very unequal in merit. They are seldom destitute of wit, but the wit is often coarse, and they are neither as pregnant with thought, nor as entertaining, as the characters in the "Microcosmography" of Bishop Earle. The "Microcosmography" was published under the name of Edward Blount in 1628, and the book was not known as the work of Bishop Earle for several years. His repertory of characters is, if possible, more varied than that of Overbury: "a Carrier," "a Young Gentleman of the University," "a Trumpeter," "a Critic," a "Shop-keeper," are a few of them. Single words and phrases can give little idea of the book which well repays perusal. There is more human feeling in his conceits than in Overbury's writings. Take for example a few passages out of his character of "A Child." "A child is a man in a small letter, yet the best copy of Adam before he tasted of Eve and the apple, and he is happy whose small practice in the world can only write his character. His soul is yet a white paper, unscribbled with observations of the world, wherewith at length it becomes a blurred note-book. His hardest labour is his tongue, as if he were loath to use so deceitful an organ, and he is best company with it when he can but prattle. We laugh at his foolish parts, but his game is our earnest, and his drums, rattles, and hobby-horses but the emblems and mocking of man's business. Could he but put off his body with his little coat, he had got eternity withouta burden, and exchanged but one heaven for another."

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Just as admirable is his character of "A Grave Divine." "A grave divine is one that knows the burthen of his calling, and hath studied to make his shoulders sufficient, for which he hath not been hasty to launch forth of his port the University, but expected the ballast of learning and the wind of opportunity. Divinity is not the beginning but the end of his studies to which he takes the ordinary stair and makes the arts his way. . . . The ministry is his choice, not refuge, and yet the pulpit not his itch, but fear. . . . In matters of ceremony he is not ceremonious, but thinks he owes that reverence to the Church, to bow his judgment to it, and make more conscience of schism than a surplice." . . . And he concludes: "His death is the last sermon where in the pulpit of his bed he instructs men to die by his example." Bishop Earle himself, in his latter days, might have sat for this portrait. Isaac Walton said of him that "since Hooper died none had lived whom God had blessed with more innocent wisdom, more sanctified learning, or a more pious, peaceable, primitive temper." Earle excels, too, in the definitions with which he prefaces his characters. "An idle gallant is one that was born and shaped for his clothes, and if Adam had not fallen, had lived to no purpose." "A plain country fellow is one that manures his ground well but lets himself lie fallow and untilled." "A tobacco-seller is the only man that finds good in it which others brag of but do not, for it is meat, drink, and clothes to him." "A weak man is a child at man's estate—one whom nature huddled up in haste and left his best part unfinished." "A contemplative man is a scholar in this great university the world, and the same his book and study."

The extraordinary popularity of the works of Overbury and Earle was no doubt due to the fact that their contemporaries recognized in them speaking portraits of their contemporaries. If time and the change of fashion have cast a shadow of obscurity over some details of the portraiture, yet these have only the greater interest for the antiquarian. Earle's lively picture of St. Paul's Cathedral, under the title of "Paul's Walk"—as a sort of Rotten Row, where the dandies of the day exhibited themselves, and City Exchange, where the merchants met to do business—is an instance of this. The two authors are indissolubly linked together by their works, but their lives present a strange contrast—the one was a courtier who rose to favour in the sunshine of the Court, and in some mysterious way, incurring the displeasure of his sovereign, died a miserable death by slow poison in the Tower; the other a divine who followed into exile the fallen fortunes of his king, and was rewarded for his fidelity by the Bishopric of Salisbury.

Very different from either of the works just noticed are the Characters of Samuel Butler, the author of "Hudibras." If Earle is the Sir Joshua Reynolds, Butler is the Hogarth of prose portrait-painting. There is a venom in his wit which is absent in the earlier writers. As an example of his style I will read a passage out of his "Character of a Lawyer:—"The lawyer is a retailer of justice that uses false lights, false weights,

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and false measures His pride increases with his practice, and the fuller of business, he is like . . . a sack—the bigger he looks. He draws his bille, more extravagant and unconscionable than a taylor, for if you cut off two-thirds in the beginning, middle, or end, that which is left will be more reasonable and nearer to sense than the whole, and yet he is paid for all. All that appears of his studies is in a short time converted into waste paper, taylors' measures, and heads for children's drums. He will screw and wrest law as unmercifully as a tumbler does his body to lick up money with his tongue. His client finds the Scripture fulfilled in him that it is better to part with a coat, too, than go to law for a cloke, for as the best laws are made of the worst manners, even so are the best lawyers of the worst men. The law is like that double-formed, ill-begotten monster that was kept in an intricate labyrinth and fed with men's flesh, for it devours all that come within the mazes of it and have not a clue to find their way out again."

Butler's definitions are singularly lucid and complete. "A romance-writer is a man who pulls down old histories to build them up finer again after a model of his own designing" "An undeserving favourite is a piece of base metal with the king's stamp upon it, a fog raised by the sun to obscure his own brightness." "A melancholy man is one that keeps the worst company in the world—that is his own—and tho' he be always falling out and quarrelling with himself, yet he has not power to endure any other conversation."

The principal charm of Butler's writing is his command of similes and metaphors which are mostly coarse and homely, but drive his meaning home with wonderful force and precision. Take for instance three consecutive sentences in his character of "The Melancholy Man," whose definition has just been quoted: "Whatsoever makes an impression in his imagination works itself in like a screw, and the more he turns and winds it the deeper it sticks, till it is never to be got out again. The temper of his brain being earthy cold and dry, is apt to breed worms that sink so deep into it no medicine in art or nature is able to reach them. He leads his life as one leads a dog in a slip—that will not follow, but is dragged along until he is almost hanged, as he has it often under consideration to treat himself in convenient time and place if he can but catch himself alone."

The Characters of Butler, however, like those of his predecessors, have one great defect. Not even the wit and fertility of illustration which adorn every page can prevent the work being monotonous. It is the great merit of La Bruyère that he saw and successfully strove to avoid the characteristic defect of this kind of writing. Himself a translator of Theophrastus, he makes the Greek writer his model but eschews his method. He does not content himself with an enumeration of qualities or a series of types, but in his essays he intermingles with his clever sketches of the personages of his day witty apologues and

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acute maxims on character and conduct written in an admirably terse and epigrammatic style. He has caught something of the manner of Montaigne, and his maxims have the piquancy of Larochefoucault. He is such a skilful master of style that he can put a new and attractive face on an old truism by a turn of expression. It is part of the charm of his style to surprise the reader by sudden changes of manner. On an instant he ceases to jest and adopts a serious tone. What a grim picture he gives of the French peasantry of the seventeenth century. "We meet with certain wild animals, male and female, spread over the country, black and tann'd with the sun, link'd down to the earth which they are always digging, and turning up with unwearied resolution. They have something like an articulate voice, and when they stand erect discover a human face, and indeed are men. At night they retire into their burrows where they live on brown bread and water, roots and herbs. They save other men the trouble of sowing, labouring, and reaping for their maintenance, and deserve, one would think, not to want the bread they sow themselves."

I have indulged so much in the luxury of quotation that I cannot give any further extracts from the work of the French author who is deservedly one of the most famous of the imitators of Theophrastus. His great popularity in his own day is largely accounted for by the fact that his contemporaries recognized living personages as the butts of his satire. His work was much imitated in England in the eighteenth century, and readers of the "Spectator" are familiar with the translation of the most famous of his characters, the character of Menalcas, the absent-minded man in an essay of Budgell on the same subject. This character is frequently said to be overdrawn, and is quoted as an instance of La Bruyère's extravagance, but Fielding's "Parson Adams" gives quite as singular examples of absence of mind; and Disraeli, in the "Curiosities of Literature," records a story of the Count de Brancas who was well known by his contemporaries to be the original of the sketch, which, if true, is sufficient to acquit La Bruyère of the charge brought against him. "The Count," writes Disraeli, "was reading by the fireside (but heaven knows with what degree of attention), when the nurse brought him his infant child. He throws down the book. He takes the child in his arms. He was playing with her when an important visitor was announced. Having forgot he had quitted his book and that it was his child he held in his hands, he hastily flung the squalling innocent on the table." I have only time to allude briefly to the last development in English literature of the art of character-writing in the pages of the "Spectator." Character-sketches of the ordinary kind—that is to say, witty descriptions of types of human nature, are common in the "Spectator" as in the "Tatler," the "Rambler," and less known similar works such as the "Humourist." What can be better in its kind than Addison's description of female orators? But the character of "Sir Roger de Coverley" transcends these narrow limits and supplies the link

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between the character-sketch and the novel. We have in Sir Roger not a mere description of a type but a living personality. The skill of the essayist has compacted out of such slight materials as a few stray sketches of Sir Roger at his country-seat; at the assizes; in his parish church; at the play; among the tombs at Westminster Abbey, a character as lovable as any in fiction. His very weaknesses and prejudices only serve to embellish his character. What pathos not unmingled with an undercurrent of delicate humour there is in the account of Sir Roger's death brought to the "Spectators' Club!"

It is a far cry from the characters of Theophrastus to the essays of Steele and Addison, but the kindly, large-hearted censors of morals in the reign of Queen Anne are members of the same literary family as the Greek philosopher who portrayed Athenian society more than two thousand years ago.

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ON A FOSSIL FISH *(CHONDROSTEUS)* FROM BARROW-ON-SOAR, HITHERTO RECORDED ONLY FROM LYME REGIS.

By MONTAGU BROWNE, F.Z.S. (Read before Section "E.")

SOME time ago, I was induced to take up the study of Fossil Fishes of the counties of Leicestershire and Rutland, when writing my long-delayed work on the vertebrates of those counties. From the few specimens we had in the Museum, and by the silence of the local authorities on the subject, I imagined I had an easy task before me, and I entered the arena with the proverbial light heart. At the present moment, however, so much matter has unexpectedly accumulated, as to prove that but little was known of the rich stores of interesting forms awaiting discovery. And now, restricting the range of this Paper, I propose to take *Chondrosteus* only for my theme, giving a sketch of what is known of this new addition to the fossil *fauna* of the County; but before doing so I would wish to point out that, as the extinct *Chondrosteus* is closely allied to the living Sturgeons, it would be better to first say a few words upon what is known of the latter, which are scientifically divisible as follows:—

CLASS PISCES.

SUB-CLASS *Teleostomi.*

Order Chondrostei
- Family *Acipenseridæ*
  - Genus *Acipenser*
  - ,, *Scaphirhynchus*
- Family *Polyodontidæ*
  - ,, *Polyodon (=Spatularia)*
  - ,, *Psephurus*

DISTINGUISHING CHARACTERISTICS.

(Compiled from Günther.)*

Family *Acipenseridæ*:—"Body elongate, sub-cylindrical, with five rows of osseous bucklers. Snout produced, *subspatulate* or *conical*, with the mouth at its lower surface, small, transverse, protractile, *toothless*. *Four barbels* in a transverse series on the lower side of the snout. Vertical fins, with a single series of fulcra in front. Dorsal and anal fins approximate to the caudal."

Genus *Acipenser*:—"The rows of osseous bucklers are not confluent on the tail. *Spiracles present.* Caudal rays surrounding the extremity of the tail."

Genus *Scaphirhynchus*:—Snout spatulate; posterior part of the tail attenuated and depressed, so that it is entirely enveloped by the osseous scutes. *Spiracles none.* The caudal rays do not extend to the extremity of the tail, which terminates in a filament."

* An Introduction to the Study of Fishes by Albert C. L. G. Günther, M.A., M.D., Ph.D., F.R.S., 1880.

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Family *Polyodontidæ*:—"Body naked, or with minute stellate ossifications. Mouth lateral, very wide, *with minute teeth* in both jaws. *Barbules none.* Caudal fin, with fulcra. Dorsal and anal fins approximate to the caudal."

Genus *Polyodon* (= *Spatularia*): — The snout is produced into an exceedingly long, shovel-like, process, thin and flexible on the sides. Spiracles present. Upper caudal fulcra narrow, numerous."

Genus *Psephurus*:—"Differs from *Polyodon* in having the rostral process less depressed and more conical. Upper caudal fulcra enormously developed, and in small number (six)."

Günther remarks that "Sturgeons are, perhaps, the geologically youngest Ganoids, evidences of their existence not having been met with hitherto in formations of older date than the Eocene Clay of Sheppey.* They are exclusively inhabitants of the temperate zone of the Northern Hemisphere, being either entirely confined to fresh water, or passing, for the purpose of spawning, a part of the year in rivers, and are indeed the largest fishes of the fresh waters of the Northern Hemisphere, specimens ten feet long being of common occurrence. The ova are very small, and so numerous that one female has been calculated to produce about three millions at one season; therefore their propagation, as well as their growth, must be very rapid; and although in many rivers their number is annually considerably thinned by the systematic manner in which they are caught when they ascend the rivers in shoals from the sea, no diminution has been observed. Wherever they occur, they prove to be most valuable on account of their wholesome flesh. In Russia, besides, two not unimportant articles of trade are obtained from them, viz., caviare, which is prepared from their ovaries, and isinglass, which is made from the inner coats of their air bladder. True Sturgeons are divided into two genera, *Acipenser* and *Scaphirhynchus*. Of the Genus *Acipenser*, about twenty different species of Sturgeons may be distinguished from European, Asiatic, and American rivers. The best known are the Sterlet *(A. ruthenus)* from Russian rivers, celebrated for the excellency of its flesh, but rarely exceeding a length of three feet; the Californian Short-snouted Sturgeon *(A. trachyrhynchus)*; the Hausen *(A. huso)*, from rivers falling into the Black Sea and the Sea of Azov (rare in Mediterranean), sometimes twelve feet long, and yielding an inferior kind of isinglass; the Chinese Sturgeon *(A. sinensis)*; the common Sturgeon of the United States *(A. maculosus)* which sometimes crosses the Atlantic to the coasts of Great Britain; Güldenstædt's Sturgeon *(A. güldenstædtii)*, common in European and Asiatic rivers, which yields more than one-fourth of the caviare and isinglass exported from Russia; the common Sturgeon of Western Europe *(A. sturio)*, which attains to a length of 18 feet, and has established itself also on the coasts of Eastern North America." The Leicester Museum possesses a fine specimen of

* See, however, A. S. Woodward, on the "Palæontology of Sturgeons," 'Proceedings of the Geologists' Association,' p. 30.

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this species, caught, some years ago, in the Trent, near Newark, and it is also, probably, this species, of which specimens are reported by the late James Harley as being taken in the Soar below Loughborough, and by Mr. Ingram from the little river Smite, near to Belvoir.

Of the second genus—*Scaphirhynchus*—"Four species are known: one *(S. platyrhynchus)* from the river-system of the Mississippi, and the three others from Central Asia; all are exclusively fresh-water fishes; their occurrence in so widely distant rivers is one of the most striking instances by which the close affinity of the North American and North Asiatic *faunæ* is proved."

Of the second family, *Polyodontidæ*, of the genus *Polyodon* "A single species *(Polyodon folium)* occurs in the Mississippi, and grows to a length of about six feet, of which the rostral shovel takes about one-fourth; in young examples it is comparatively still longer."

Of the genus *Psephurus* we find one species, viz.: *Psephurus gladius*, "Which inhabits the Yan-tse-Kiang and Hoangho, the distribution of the *Polyodontidæ* being perfectly analagous to that of *Scaphirhynchus*. It grows to an immense size, specimens of twenty feet in length being mentioned by Basilewsky. The function of the rostral process in the economy of these fishes is not yet sufficiently explained. Martens believes that it serves as an organ of feeling, the water of those large Asiatic and American rivers being too turbid to admit of the Sturgeon seeing its prey, which consists of other fishes. The eyes of *Psephurus*, as well as *Polyodon*, are remarkably small. Both fishes are used as food."

I will now give a brief abstract of the structure of Sturgeons and of *Chondrosteus*.

Speaking of the former, Huxley says:—"The exoskeleton presents the most extreme variations in the *Ganoidei*. *Spatularia* is naked; *Acipenser* and *Scapirhynchus* develop numerous dermal plates composed of true bone.

The endoskeleton is not less diversely modified; and it is worthy of remark that no sort of relation, either direct or inverse, is traceable between the completeness of the endo-skeleton and that of the exo-skeleton. Thus *Spatularia*, *Scapirhynchus* and *Acipenser* have a persistent notochord, in the sheath of which mere cartilaginous rudiments of the arches of vertebræ appear. The ribs, when present, are partially ossified."

Traquair, in dealing with the Sturgeons *(Acipenseridæ)*, writes:—"Tail completely heterocercal; notochord persistent; paired fins not lobate; infraclaviculars present; rays of dorsal and anal fins exceeding in number their supporting interspinous bones; præoperculum, when present, tending to extend forwards over the cheek; branchiostegal rays in most, but large jugulars in none. Skin in many furnished with osseous scutes or with rhomboidal scales; in some naked, save on the

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prolongation of the body along the upper lobe of the caudal fin. Including the families *Acipenseridæ*, *Spatularidæ*, *Chondrosteidæ*, *Palæoniscidæ*, *Platysomidæ*."*

At p. 40 *op. cit.*, he further remarks:—"The opercular and branchiostegal apparatus is indeed feebly developed in *Polyodon*, and even more so in *Acipenser*, though the latter has a cranial shield of closely-fitting ganoid plates. But here a connecting link is seen in *Chondrosteus*, in which, though the squamation of the body is apparently in the same condition as in *Polyodon*, we have nevertheless a well-developed opercular apparatus and a set of branchiostegal rays in the form of strong, imbricating, osseous plates. The cranial buckler of *Chondrosteus* also consists of strong, closely-fitting plates, as in the Sturgeon."

Chondrosteus was first known to Louis Agassiz, who named, but did not describe, it. ("Poissons Fossiles," vol. ii., part 2, p. 280.) He writes:—

"Je ne connais encore que deux représentans fossiles de cette famille; l'un appartient au genre *Accipenser* proprement dit et provient de l'argile de Londres de Sheppy; c'est mon *Accipenser toliapicus;* l'autre constitue un genre à part qui n'a pas de représentant vivant. Je l'ai nommé *Chondrosteus accipenseroides*. Il provient du lias de Lyme Regis. L'existence d'une espèce de cette famille dans le lias, et d'une autre dans un terrain tertiare, me fait penser que l'on en découvrira encore d'autres dans les couches intermédiaires."

Commenting upon this, Sir Philip Egerton writes:—†

"The specimens first discovered were portions of the caudal fin, and it was from the examination of these that he established the genus *Chondrosteus*, and determined its affinities to the Sturgeons.

The most perfect specimen yet discovered is contained in a nodule of indurated lias. The rostral and caudal extremities are deficient, and it is otherwise much injured by the attempts to relieve it from the matrix in which it is imbedded. Excluding what remains of the head, and measuring what remains of the pectoral fin with the scapulocoracoid arch to the hinder margin of the anal fin, the length of the trunk is 15 inches. The greatest vertical depth is immediately in front of the dorsal fin, where it measures 6 inches. In a recent Sturgeon, having the same longitudinal dimensions, the greatest vertical depth is only 3 inches, or in proportion to the length as 1 to 5, the relative proportions in the fossil being as 2 to 5. The comparative measurements are more disproportionate when applied to a restoration of the fossil genus. By selecting

* 'The Ganoid Fishes of the British Carboniferous Formations,' by Ramsay H. Traquair, M.D., F.R.S.E., F.G.S., Part I., *Palæoniscidæ* p. 8. (All these families are, however, now included in the Order *Chondrostei*.)

† On *Chondrosteus*, an Extinct Genus of the *Sturionidæ*, found in the Lias Formation at Lyme Regis. By Sir Philip de Malpas Grey Egerton, Bart., M.P., F.R.S., F.G.S., &c. ('Phil. Trans.' (Royal Society), vol. xlvii., 1858, pp. 871-885, pls. lxvii.-lxx.)

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from the numerous specimens which have been found, a tail of a size corresponding with the other parts of the individual under description, and adjusting it thereto, the additional length obtained is 9 inches, making a total length of 24 inches from the attachment of the pectoral fin to the extremity of the upper lobe of the tail. The measurement of the corresponding part in the recent Sturgeon gives an increase of 7½ inches, or a total length of 22½ inches; the result being that the proportion of depth to length in the fossil is as 1 to 4, and in the recent fish as 1 to 7½. The vertical diameter of the fossil at the point of fracture behind the anal fin is 4½ inches, the corresponding measurement of the recent fish is only 1 inch. It will be apparent from these dimensions that the Sturgeon of the lias differs from the existing Sturgeons, in having a shorter and more bulky body, deepest in its middle portion, and contracting very gradually posteriorly as far as the anal fin. It is shown by other specimens that the diminution of bulk behind this point was more rapid down to the point whence the caudal fin expands. The breadth of body was not, as it is in the Sturgeon of the present day, commensurate with the depth; for it is evident, from the proximity of the pectoral and ventral fins of either side to their fellows, that the sides of the fish were more flattened, and that the horizontal diameter of the body was considerably less than the vertical one. However striking and distinctive these proportions may be, compared with the graceful and taper outlines of the recent Sturgeons, other characters are afforded by the structure, form and position of the natatory organs, equally corroborative of generic difference.

The fins in all the recent Sturgeons are thus arranged:—The ventral fins are situated at the commencement of the posterior third segment of the body; the anal fin occupies a median position between these fins and the lobe of the tail, whilst the dorsal fin is placed above the anal fin, having its anterior rays a little in advance of the first rays of that fin. In *Chondrosteus* the ventral fins are found midway between the pectoral fins and the tail; the dorsal fin is immediately above the ventral fins, and the anal fin approximated to the lower lobe of the tail. As regards size, all the fins are proportionately larger than those of the existing Sturgeons, as might naturally be inferred from the greater bulk of the fish.

The collection of Fossil Fishes in the British Museum contains two specimens of *Chondrosteus*, showing some of the head-bones and a pectoral fin of individuals of gigantic proportions. Mr. Harrison, of Charmouth, has kindly forwarded, for inspection, a tail of proportionate size, and which is supposed to have belonged to the same individual, as one of the Museum specimens. Although size alone is no criterion of specific difference, it is nevertheless of some importance in this instance, where, out of a very large number of specimens found in one locality, some are so greatly disproportioned as to be easily eliminated, while none afford any evidence of gradation from large to small. It is not, however,

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necessary to rely upon size alone in this case, since it is associated with other peculiarities constituting specific characters. The only portions of the head recognisable in the specimen in the British Museum are the parietal and mastoid* bones. The surface of these is rough and granular, showing a considerable amount of dermal consolidation. The outer posterior angles of the mastoid bones are extended backwards, and afford articular surfaces for the attachment of the upper extremities of the suprascapulars. One of the latter bones is preserved, and measures 6 inches in length. The tail, from the collection of Mr. Harrison, measures 18 inches in length. The lower lobe is imperfect, but the total expanse of the organ cannot have been less than 20 inches. The length of the entire fish must probably have been above 5 feet. The most remarkable character of the caudal fin is the excessive development of the scales bordering the upper margin. The size and solidity of these scales is such that they more resemble the broad teeth of an *Acrodus* than any dermal development with which I am acquainted. In consequence of this peculiarity, I have named this species *Chondrosteus pachyurus*. The numerous specimens derived from smaller individuals present indications of two species, one having the bones of the head thin and smooth, the other being characterized by stronger cranial plates, having a granulated exterior. The anal fins of the latter are more massive, and have the transverse articulations at shorter intervals. I propose to retain the Agassizian name *Chondrosteus acipenseroides* for the former, and to designate the latter as *Chondrosteus crassior*."

Quite recently, Mr. J. W. Davis, F.L.S., F.G.S., &c., in an exhaustive treatise upon *Chondrosteus acipenseroides*,† denied these specific differences, and wrote that "A careful comparison of the numerous specimens of the genus *Chondrosteus*, at present located in the new Natural History Department of the British Museum, has led to the conclusion that there is no specific difference between the species *Chondrosteus acipenseroides* (Agassiz), and *C. crassior* (Egerton). The characters separating the two, as stated by Sir Philip Egerton, are slight, consisting in the relative thickness of the cranial bones and the position of the anal fin. The former difference can scarcely be maintained, because the specimens merge gradually the one into the other, and the thicker ossification appears to depend more on the age of the fish than anything else. The evidence of the anal fin is derived from very fragmentary specimens. The anal fin of *C. crassior* is described as more massive and having the transverse articulations at shorter intervals than the anal fin of *C. acipenseroides*—the latter being represented in the specimen depicted on plate lxvii. (Phil. Trans.), and the former, in conjunction with the caudal fin, regarded by the author as belonging to the series *C. crassior*, on plate lxx. It was unfortunate that

* This so-called "mastoid" is, however, the squamosal, this being in *Chondrosteus* a membrane-bone.

† Quarterly Journal of the Geological Society, August, 1887, pp. 605-16.

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no specimen was known to Sir Philip Egerton having the body sufficiently well preserved to show the actual relationship of the caudal fin with the remaining constituents. The specimen herein described proves that there is no difference between the tail described as belonging to *C. crassior* and the one actually attached in this specimen to the body of *C. acipenseroides*, so that the former must be united with the latter species. It is very probable that better preserved specimens will exhibit an equal similarity in the anal fins; and until such are found it must be remembered that the anal fin on which Sir Philip Egerton based his determination is the one attached to the caudal fin mentioned above, and which is undoubtedly the tail of *C. acipenseroides* (Ag.)."

But as a further comment upon this, Dr. Traquair writes, at p. 248 'Geological Magazine,' 1887:—"Mr. Davis does not seem, however, to have made use of the magnificent suite of specimens of *Chondrosteus* in the British Museum, which contains not only the types of Sir Philip Egerton's figures, but also a splendid array of additional examples, mostly also from the Egerton and Enniskillen Collections," leaving the matter rather in doubt as to whether he believes in *C. crassior*.

In the very beautifully preserved specimen from Lyme Regis, figured and described by Mr. Davis,* are shewn structures bearing upon those figured upon plate II. of the present treatise, and I therefore quote those portions, as helping to elucidate the anatomy of the local specimens hereafter described (*see pp.* 31–4). Taking the pectoral fin first, he states that this "is large and comprises 42 rays. The anterior ray is spinous, thick, with expanded base for attachment; it gradually tapers to a point, terminating 2·5 inches from the base. The succeeding rays are the longest. In this specimen there is preserved a length of 4·25 inches, but the distal extremities are imperfect, and at least one inch more would be required to complete the length of the fin-rays. The base of the fin nearly approaches 3·0 inches in length, and the fin-rays gradually diminish backward; the posterior rays are not more than half the length of the anterior ones. The rays increase, towards the distal end, by bifurcation. A keel extends along the lateral surface of each ray, and a line of pustulations extends along the median surface of the keel. The anterior ray or spine is quite smooth. The fin is capable of wide expansion; as preserved, the breadth of the outer margin of the fin is equal to the length of the anterior rays. The pectoral fins in this species approach the existing forms in possessing a strong, spinous, anterior ray, and, to the same extent, seem to differ from the fossil forms described by Sir Philip Egerton from the same locality."

Having written, at pp. 612-13, of the neurapophyses he states, relative to the dorsal:—"In addition to the two sets of basal and apical neurapophyses, the dorsal fin is supported by an additional double series of bones. Connected with the apical neurapophyses there is a series of

* 'The Quarterly Journal of the Geological Society', 1887, pp. 605-616.

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interneural spines, more or less pointed at their lower extremity, exceeding an inch in length, and with their upper extremities expanded so as to afford attachment to a second range of interneurals, to which the rays of the dorsal fin are attached. Between the expanded and rounded extremities of the two rows of interneural spines there is a continuous space which indicates a cartilaginous attachment of no small size and strength; its decay has left the two sets of bones separated by 0·3 of an inch. The interspinous bones are strong, and would afford a firm base of attachment for the rays of the large dorsal fin.

The dorsal fin extends along the back 6·5 inches, and its longest rays are fully 6·0 inches in length. It is composed of 66 rays, of which the anterior 15 are short and more or less rudimentary; they occupy 1·75 inch of the base of the fin. The first rays are short, thick, and imbricating; they gradually increase in length to about an inch. All are simple. The succeeding rays are transversely jointed, and increase rapidly in length to the seventh; the twenty-second from the anterior extremity of the fin is the longest, the succeeding rays gradually diminish to the posterior extremity of the fin. All the rays, except the anterior fifteen, are jointed quite from the base. The longest anterior rays bifurcate three inches from the base, and the division is repeated nearer the distal extremity. The bifurcation commences in the posterior rays nearer the base in proportion to the length."

I find, in a German work by the celebrated palæontologist, Karl Zittel, that he credits *Chondrosteus* with having 75 dorsal, and 50 pectoral, fin-rays. This exact number does not appear to be mentioned by any other author.

The anal fin, fairly represented in the local specimen hereafter described, was not represented in Mr. Davis' specimen.

Speaking of the tail, Mr. Davis further writes:—"The caudal fin is very large, and a most powerful organ of propulsion. The upper lobe, as in the recent Sturgeon, is the longer of the two, and its extremity is more pointed than that of the lower one. The length of the upper lobe is 12·0 inches, that of the lower 10·5 inches, and the terminations of the two are 13·0 inches apart. The upper external margin of the fin is formed of a series of large sigmoidally-curved, imbricating, fulcral scales. Those attached immediately behind the pedicle of the tail are about 1·0 in. in length, 0·2 in. in thickness in the middle; the basal and distal extremities are somewhat spatulate and thin. Succeeding scales become more attenuated, and midway their length has increased to 2·5 inches, with a medium thickness of 0·1 inch, thence to the end they diminish both in length and thickness. The strong basal fulcral scales are directly supported by a series of short but thick neurapophyses. The latter do not appear to extend more than two inches beyond the base of the tail. The lower lobe of the tail is supported by hæmapophyses of larger size and more solid construction than the neurapophyses; they are expanded at the base and have evidently been firmly attached to a powerful

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vertebral axis. The latter was entirely cartilaginous, and has disappeared. The hæmapophyses can be distinguished a distance of six inches from the base of the tail; they gradually diminish in length, but become broader and spatulate as they approach the termination of the vertebral column. Attached to the hæmapophyses there is a long series of inter-hæmal bones, which form the base of attachment for the rays of the fin. The latter are strong and jointed from the base. A few short rudimentary rays are followed by others which extend to the extremity of the lobe; they are divided towards the extremity of each ray, the divided portions again bifurcating until the external margin of the fin has assumed a more or less filamentous condition. The rays decrease in length and thickness as they are successively attached to the fin, extending quite to the extremity of the upper lobe. From the base to a point halfway towards the termination of the upper lobe 72 rays may be counted; beyond this point there are many others, but the actual number is not easy to determine."

The specimen of *Chondrosteus* described by Mr. Davis is, he says, "nearly twice the length of those described by Sir Philip Egerton (excluding *C. pachyurus*, which is only mentioned incidentally), whilst the depth of the body, taken in front of the dorsal fin, is 6 inches, the same as that of *C. acipenseroides*, so that this species approaches much more nearly to the existing types. In this specimen the length of the body from the base of the pectoral fin to the pedicle of the caudal fin is 24 inches, the length of the caudal is 12 inches; in Egerton's specimens the proportions are as 15 inches to 9 inches; though it is possible that as the caudal fin was not attached to the body in the latter instance, the estimation of the proportionate lengths of the body and tail may have been exaggerated in the case of the latter. The ventral and dorsal fins are described as being midway between the base of the pectoral and that of the caudal; in this specimen the distance between the pectoral and ventral is 14 inches, and between the latter and the caudal 10 inches. The dorsal fin of this specimen is readily distinguished by the large number of short rudimentary or accessory rays forming its anterior portion; and the pectoral fin is possessed of a strong anterior spinous ray, very similar to that of some recent Sturgeons."

With reference to other parts of *Chondrosteus*, some of which are shewn on plate I. of this Paper, Dr. Traquair writes at p. 249, 'Geological Magazine,' 1887:—

"*Cranial Shield.*—The elements of the main portion of the cranial shield have been recognised by Sir P. Egerton and by Mr. Davis, the former of whom enumerates 'the parietals, the mastoids, the frontals, and the prefrontals,'—the latter stating that the 'frontals, postfrontals, parietals, mastoid, and some of the occipital plates are present.' This cranial shield is exhibited in many of the British Museum specimens, but in none have I seen it better displayed than in one belonging to the Museum of Practical Geology, from which fig. I.* has been

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FIG. 1.—Cranial shield of *Chondrosteus acipenseroides*; somewhat reduced (after Traquair.) (Mus. Practical Geology.) *f.*, frontal; *op.*, operculum; *p.*, parietal; *p.f.*, post-frontal; *p.t.*, post-temporal; *s.t.*, supra-temporal; *sq.*, squamosal.

taken. Here we have two oblong parietals *(p.)* joining each other in the mesial line, and each is flanked externally by a rather larger squamosal *(sq.)*, the 'mastoid' of a by-gone nomenclature. In advance of the two parietals are two large frontals *(f.)*, also in opposition mesially, while posteriorly, and externally, each of them also touches the squamosal of its own side. Then, occupying a corner between the hinder part of the external margin of each frontal and the anterior external margin of the corresponding squamosal, is a rather small posterior frontal *(p.t.)*. In no specimen which I have seen are the

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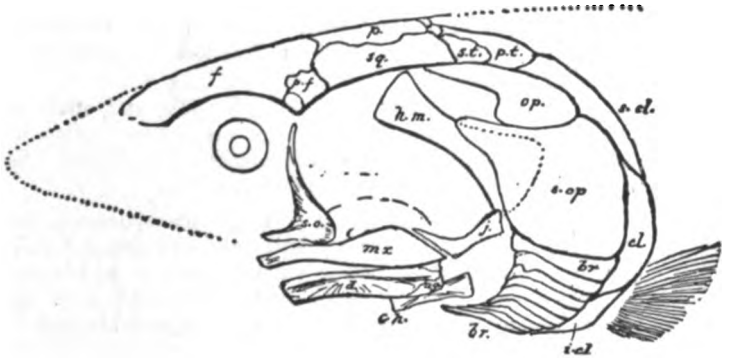

FIG 2.—*f.*, frontal ; *p.f.*, post frontal ; *p.*, parietal ; *sq.*, squamosal ; *s.t.*, supra-temporal ; *p.t.*, post-temporal ; *op.*, operculum ; *s.cl.*, supra-clavicle ; *s.op.*, sub-operculum ; *cl.*, clavicle ; *i.cl.*, infra-clavicle ; *br. br.*, branchiostegal rays ; *ag.*, angular ; *c.h.*, cerato-hyal ; *d*, dentary ; *mx.*, maxilla ; *j.*, jugal ; *h.m.*, hyomandibular ; *s.o.*, sub-orbital.

plates in advance of the frontals in sufficiently good preservation to enable one to map out or describe them : the outline of the snout, as given in the restoration (fig. 2),* is therefore conjectural. Behind the posterior margins of the parietals and squamosals, and between these and the post-temporal elements of the shoulder-girdle, is a transverse row of five small plates *(s.t.)*. One of these, of a rudely polygonal shape, is median, and placed just at the union of the two parietals, and is flanked on each side by another plate, of which the right is larger, the left smaller than itself. External to each of the latter is the remaining plate of each side, of considerably larger size, of an irregularly triangular shape, and placed between the posterior margin of the squamosal and the post-temporal *(p.t.)*, which latter it largely overlaps. These are certainly the plates which in other Ganoid fishes *(Lepidosteus, Polypterus)* have sometimes been called 'supra-occipitals' and 'epiotics,' but they are mere scale-bones, and occupy the place of the supra-temporal chain in Teleostei.

* The blocks of these figures—Nos. 1 and 5 in Dr. Traquair's treatise—have been kindly lent to me by that gentleman for use in this article.

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A very distinct suborbital bone (*s.o.*, fig. 2) is seen in a large number of specimens. It consists of two limbs—an upper and longer vertical one meeting below at nearly a right angle with a shorter horizontal portion, the bone being considerable expanded at the junction. Above, the suborbital was suspended from the post-frontal region of the cranial shield,—below, it comes in contact with the middle of the maxilla. This suborbital is the bone which Sir Philip Egerton has interpreted as the 'præmaxilla' in his memoir.

All these plates are externally marked with pores, and often with furrows and ridges radiating from the centres of ossification; often, also, the surface becomes corrugated, sometimes almost granulated; but I have seen no positive traces of ganoine upon the surface.

Internal Cranial Bones.—There is a large parasphenoid, much resembling that of *Acipenser* in shape; but, unlike Professor Young, I can find no remains of ossification in the chondrocranium, which can be described, or even relied upon as being such. Although such ossifications may very likely have existed, it seems very improbable that they attained any considerable dimensions.

Hyoid Arch.—The most easily recognised bone of the entire head is the hyomandibular (*h.m.*, fig. 2.), which passes from the squamosal region obliquely downwards and backwards. It is shaped much as it is both in *Acipenser* and *Polyodon*, being constricted in the middle and flattened anteroposteriorly in its upper part, laterally in its lower. In one specimen in the British Museum there is an appearance as of an ossified symplectic, extending from the lower extremity of the hyomandibular towards the articulation of the mandible; this I do not insist upon, as it is not corroborated by any other specimen, though the existence of a cartilaginous one may be safely assumed, considering the large space between the lower extremity of the hyomandibular and the articulation of the lower jaw.

The ceratohyal (fig. 2.) is also very easily recognisable, and requires no special description.

Opercular apparatus.—The opercular flap is principally supported by a large, broad, somewhat irregularly rhombic plate (*s. op.*, fig. 2), overlapping, with its anterior superior angle, the posterior inferior part of the hyomandibular, and leaving a considerable space between its upper concave margin and the edge of the cranial shield. This is the bone which has hitherto been called 'operculum' in *Chondrosteus*, and it certainly corresponds exactly in position to the so-called operculum in *Polyodon*. It is, however, equally clear that it corresponds also in position, as well as in general shape, with the suboperculum of *Palæoniscus*;* and that this is its true interpretation is proved by the discovery of the proper

* Described as 'interoperculum' in my Memoir on the Structure of the Palæoniscidæ. I have, however, abandoned that view, and now consider the plate intercalated between it and the operculum in such genera as *Rhabdolepis* to be not a suboperculum, but merely an accessory element.

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operculum (*op.*) lying above it and between it and the cranial shield (fig. 2). The shape of this operculum may be aptly likened to that of an inverted comma, the tail passing upwards and forwards to the cranial shield, the convex margin being posterior and the concave one anterior, a considerable space in front of the bone and above the suboperculum being still left uncovered. The opercular flap is continued downwards and forwards by a series of ten imbricating branchiostegals (*br.*), which are broad and plate-like where they immediately follow the suboperculum, though anteriorly they become narrow and slender.

Conclusion.—Although there is no evidence of any long snout, *Chondrosteus* resembled *Polyodon* in the general shape of the body, in the form and arrangement of the fins, and, above all, in the absence of *scales* on any part, save the prolongation of the body-axis along the upper lobe of the very heterocercal tail. In other respects its affinities are more with *Acipenser*.

How like the corresponding parts in *Acipenser* are the suborbital bone, the edentulous jaws, the jugal bone, and indeed the palatal apparatus, though that has also its own peculiarities; while it seems highly probable that the mouth was protrusible as in the living Sturgeon.

But where the resemblances to *Acipenser* become weaker they come to point in another direction, namely, that of *Palæoniscus*, and of course through the Palæoniscidæ to the truly 'teleosteoid' Ganoids. This is in the first place well seen in the cranial shield (fig. 1) where the parietals and frontals are mesially in contact with each other for their whole length, where there is a well-marked supra-temporal chain, and where the post temporal is moveably articulated, whereas in *Acipenser* the frontals are entirely separated by an intercalated plate, and the post-temporals and two of the median body-plates are immoveably joined to, and form a part of the cranial buckler itself. Especially palæoniscoid is, however, the aspect of the opercular and branchiostegal apparatus, as will be seen if the reader will compare the restored drawing (fig. 2) with the figures of the heads of *Palæoniscus* and *Nematoptychius* given in my account of the Palæoniscidæ, although in *Chondrosteus* there is no præoperculum and the series of branchiostegal rays of the two sides may not have met in the middle. The special resemblance of the shoulder-girdle to that of Palæoniscus is also very striking, especially in the form of the post-temporal and supra-clavicular bones.

In my already-quoted essay on the structure of the Palæoniscidæ, I pointed out certain strange and previously unrecognised resemblances which *Palæoniscus* bore to *Polyodon*, especially in the internal skeleton, the shoulder-girdle, and the jaws and palato-quadrate apparatus (even although there *are* premaxillary bones and there is no evidence that the palato-quadrate elements met in the middle line in front). I also remarked that the resemblances between *Palæoniscus* and *Acipenser* are

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of course much less prominent. Here, however, is a form which in many of its features presents strong Palæoniscoid resemblances, but whose affinities are, nevertheless, more with *Acipenser* than with *Polyodon*!

The affinities of *Chondrosteus* seem, therefore, to radiate in three directions, towards *Acipenser*, towards *Polyodon*, and towards the Palæoniscidæ, and certainly, of all the three directions, the distance towards *Acipenser* is the least."

In this masterly exposition of the anatomy and affinities of *Chondrosteus* we have the whole subject summarised, the author pointing out wherein Egerton and Davis have been misled by superficial resemblances, and these errors I have not thought it wise to repeat merely to refute, they not bearing upon a consideration of the present specimens; but to all those who purpose studying the literature of the subject in its sequence, viz., Agassiz 1st,* Egerton 2nd,† Young 3rd,‡ Traquair 4th§ and 5th,‖ and A. S. Woodward 6th,¶ I would say that the three first cannot be comprehended, nor taken as correct in their entirety, without a thorough knowledge of the fourth and fifth, and sixth: this last—from the pen of my good friend—appearing whilst the present article was in preparation. From the well-known erudition of this skilled palichthyologist, it goes without saying that he ably summarises the most important parts of previous contributions to the literature of *Chondrosteus*, giving also a new restoration of *C. acipenseroides*, which figure he has kindly allowed me to use for this paper; and not only for this are my thanks due to him, but for much kind assistance in palichthyological matters which it is impossible to over-estimate.

So far, all these descriptions were based upon specimens from Lyme Regis,—the only place at home or abroad from whence it was known—but some years since, the Messrs. Ellis and Sons, of Barrow-on-Soar, with their unvarying kindness, presented me with a slab of Lias and its counterpart containing parts of the tail and other fins of an unknown fish, and I was led, when writing my "Vertebrate Animals of Leicestershire and Rutland," to send it for determination to Mr. A. S Woodward,

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* "*Poissons Fossiles*," vol. ii., part ii., p. 280.

† "On *Chondrosteus*, an Extinct Genus of the *Sturionidæ*, found in the Lias Formation at Lyme Regis," by Sir Philip de Malpas Grey Egerton, Bart., M.P., F.R.S., F.G.S., &c. 'Phil. Trans.' (Royal Society), vol. xlvii., pp. 871-5.

‡ "On the affinities of *Chondrosteus*, Ag.," by John Young, M.D., F.G.S. (This paper was withdrawn by permission of the Council.) Abstract: The object of this communication was to shew, from the character of the skeleton, that *Chondrosteus* belongs not to the Chondrostean division of the ganoids as stated by Agassiz, but to the Holostean division, since it possesses a well-ossified basioccipital; and the lateral walls of the cranium are composed of bones answering to the cartilage bones of ordinary Teleosteans." (Q.J.G.S., 1866, p. 596.)

§ "The Ganoid Fishes of the British Carboniferous Formations," by Ramsay H. Traquair, M.D., F.R.S.E., F.G.S., part I., Palæoniscidæ.

‖ "Notes on *Chondrosteus acipenseroides*, Agassiz," by Dr. R. H. Traquair, F.R.S., F.G.S. ("Geol. Mag.," 1887, pp. 248-257.)

¶ "On the Palæontology of Sturgeons," by A. Smith Woodward, F.G.S., F.Z.S., of the British Museum (Natural History), 'Proceedings of the Geologists' Association,' vol. xi., May, 1889, pp. 24-44.

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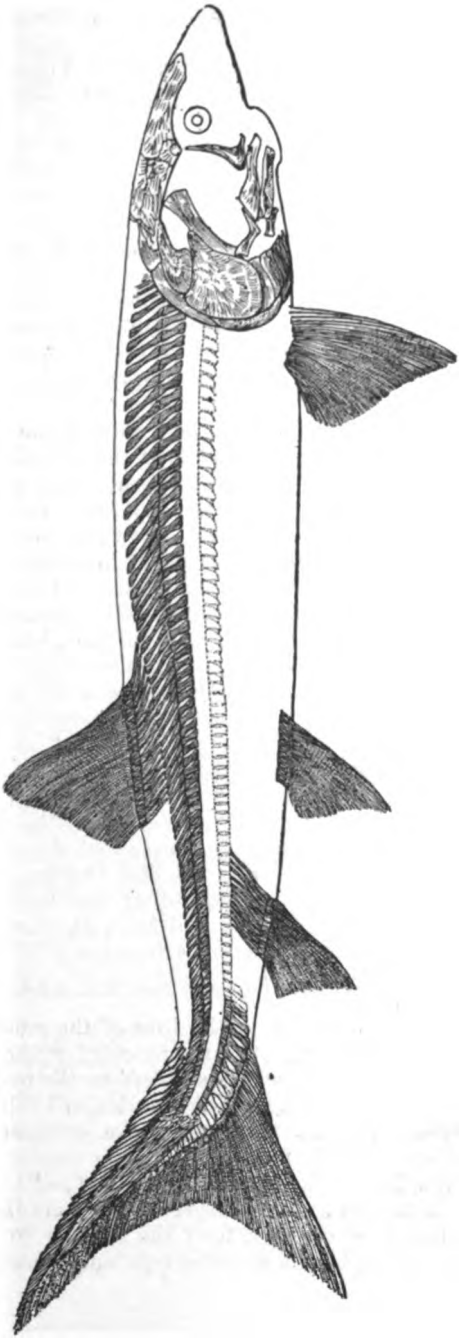

FIG. 3.—Restoration of skeleton of *Chondrosteus acipenseroides* (ag.) one sixth natural size.

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who replied :—"This unique and interesting fossil is the caudal portion of a fish evidently related to *Chondrosteus*, well known from Lyme Regis, and probably pertains to the same genus. The fulcral scutes upon the upper lobe of the tail are equally large, but too much broken to exhibit their precise form and proportions. A few of the characteristic oat-shaped scales upon the side of the caudal lobe are preserved; and there are several distinct, broad, hour-glass-shaped hæmal spines supporting the caudal fin. The latter consists of rays articulated as in *Chondrosteus*, but the outline of the fin is not shown. Remains of the dorsal and anal fins are also preserved in their natural situations, but each fin is much broken and scattered. The dorsal is considerably in advance of the anal, exactly as in *Chondrosteus*." The discovery of this specimen is briefly mentioned by Mr. Woodward in his treatise *(op. cit.)*.

As this is the first specimen known, save from Lyme Regis, I have thought it worthy of representation, and have therefore drawn it of the actual size upon stone, as plate II. of this Paper. The whole slab is in a very much abraded and broken condition, but sufficient has been made out to justify Mr. Woodward's diagnosis. At the point marked D, on the upper left-hand side of the plate, are parts of the very much disturbed and broken rays of the dorsal fin, each jointed from the base as Mr. Davis remarks, but there are no definite indications of interspinous bones or of neurapophyses. At the bottom of the plate, at the point marked A, are the remains of the anal fin, also much disturbed, and again with no definite indications of anything save the slender jointed fin-rays: above this, however, is a small bone (marked *) as also two others (similarly marked *) which may be the "hour-glass-shaped hæmapophyses, or hæmal spines, but from whence derived it is impossible to conjecture. Between the two last * * above the anal fin, is a confused mass of broken rays, apparently a displaced portion of the anal fin: even that is conjectural, and it is indeed unfortunate that the anal fin is in so very imperfect a condition, for since the first treatise by Egerton, a period of thirty-one years, no other author has described another specimen possessing the anal fin. It will be well, therefore, to give Egerton's original description of this, to be found at p. 875 of the work quoted in the foot-note on p. 30 :—

"The anal fin is placed nearer to the base of the caudal fin than to the ventral fins. It is the smallest of the natatory organs in the fossil genus, whereas the ventral fins are the smallest in the recent Sturgeon. The interhæmal spines supporting the fin are ten or twelve in number, elongated, slightly arched, and flattened at the articular extremities. The fin-rays are above thirty in number, and more slender than those of the dorsal fin. The lateral surfaces are sub-angular and not rounded, as in the dorsal and ventral fins. The transverse joints are frequent. The decrement in the length of the rays, from the anterior to the posterior limit of the fin, is very rapid, the posterior rays being short, slender, and

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finely fimbriate. The form of the fin is that of an isosceles triangle, broader at the base and less acute at the apex than the corresponding fin of the recent Sturgeon."

Coming to the caudal fin (marked C), and taking the lower lobe first, there are exhibited the many-jointed fin-rays, terminating in, or rather attached to, interhæmal bones, spines, or ossicles, broader at the proximal than at the distal extremities, the line of separation not being very distinct except at the upper extremity of the lower lobe (marked *ih.* at each end). Above this is the median portion of the upper lobe, at the lower extremity of which are some broken and disturbed "hour-glass" shaped hæmal spines or hæmapophyses (marked *hs.*) spoken of by Mr. Woodward. Just above these should be some of the "characteristic oat-shaped scales" which the trained eye of that gentleman discovered, but which I confess I do not readily determine, except in very small broken patches, not easily distinguished even on the original slab. What can be seen, however, is that these "lozenge-shaped" (Egerton), or "diamond-shaped" (Davis), or "oat-shaped" (Woodward) scales are altered toward the broken end of the slab into "rod-like and pointed at each end" (Davis), or "acicular" (Egerton) forms (marked *m.s.* = median scales). Between this and the upper lobe the neurapophyses are conspicuous by their absence. The upper lobe, although much abraded, shews, with some distinctness, the "sigmoidally-curved imbricating fulcral scales," (marked *f.s.*) thinly spatulate at their basal extremities (see Davis, p. 614) becoming more attenuated, as that author describes, toward the tip of the upper lobe.

It will be seen that, although fragmentary, these few portions of the *Chondrosteus*—which is, I think, attributable to the species *acipenseroides* of Agassiz—were valuable as coming from a new habitat, and it was therefore with unfeigned joy that amongst fragments of "all sorts and conditions" of fossils saved for me by Mr. Raven, acting for the Messrs. Ellis, I detected on the 9th of August of this year, a broken slab and counterpart of "Second-floor" Lias Limestone exhibiting part of a second example—figured of the actual size on plate I. of this Paper. This fortunately supplied parts not shewn on the other slab, added to which they were in much better preservation.

The central feature is a fine long and broad bone with rounded ends, shewing a distinctly rayed pattern ("furrows and ridges radiating from the centre of ossification," Traquair) of some beauty and of a rich brown colour. This large bone, I was led to believe might be the sub-operculum (see *s.op.*, fig. 2), and indeed, in size and shape it greatly resembles that bone as shewn in Traquair's figures, the "operculum" of Egerton and Davis, which, it must be remembered, is really the sub-operculum. In measurement, also, it agrees with that shewn on a life-sized enlargement of fig. 3, which I prepared for the Geological Room of the Leicester Museum, but Mr. Woodward, who has given the matter full consideration, replies that although a somewhat doubtful

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point is raised, yet he considers that this bone (marked *sq.* on plate I.) is more probably a squamosal (see figs. 1 and 2, *sq.*), and to this decision I bow.

Above, and to the left of this, is a conical mass of bones (marked F) which is probably part of the frontal (see figs. 1 and 2), and on the extreme left of this another squarely-shaped bone (marked *Pf.*, also shewn on figs. 1 and 2) which is likely to be the post-frontal. Below all of these are a few indefinite hour-glass-shaped basal cartilages (marked *b.c.* indifferently shewn, both on the original and on the drawing) of the pectoral fin. Below this, and attached to the basals, is a small rounded mass of rays—the upper part of the pectoral fin (marked P)—the continuation being destroyed by a break in the stone. On the right-hand side of this break, and below to the dotted lines P, is the remainder of the pectoral fin, the rays being apparently unjointed and in fair condition. The small piece marked "P (?)" may be the extremity of this fin, whilst the cross-shaped mass of rays marked *P.r.* is not part of the dorsal as I imagined, but is, so Mr. Woodward thinks, the "rays of the broken-up pectoral of the opposite side."

The two specimens we now have, shew, therefore, parts of four out of the five fins credited to *Chondrosteus acipenseroides*, and parts of three bones of the head, whilst the singular fact remains that all of these parts except the squamosal are of the exact size of those of the restoration I have made (six times enlarged from fig. 3), which would give both fishes from which the two fossils were derived an entire length (including the tail) of rather more than 41 inches.

Some day one more perfect may turn up and set at rest one or two interesting points: notably the shape and length of the anterior part of the head, and it is to be hoped that the Leicester Museum may be enabled to again thank the authorities at Barrow-on-Soar for another much-desired specimen.

Egerton, piercing the mist of the Past with retrospective eye, professed to see the form and habits of *Chondrosteus*, as thus:—"The Sturgeons of our own time, inhabiting the bottoms of the estuaries of mighty rivers, subject to frequent paroxysmal inundations, require not only an external form of least resistance, combined with powerful propulsory organs, to withstand the torrents to which they must necessarily be exposed in procuring their daily subsistence, but also a defensive armour sufficient to fortify their bodies against injury from stones and other detrital matters hurried down by the force of the streams. The liassic Sturgeons enjoyed a more tranquil existence. The evidence of the associated molluscan and radiate forms, proves the marine character of the waters they inhabited; the thinly laminated beds of shale and limestone from which their remains are exhumed, testify to the tranquil condition of the sea in which they lived; their smooth skin, harmonising in tint with the muddy bottom on which they reclined, served to conceal

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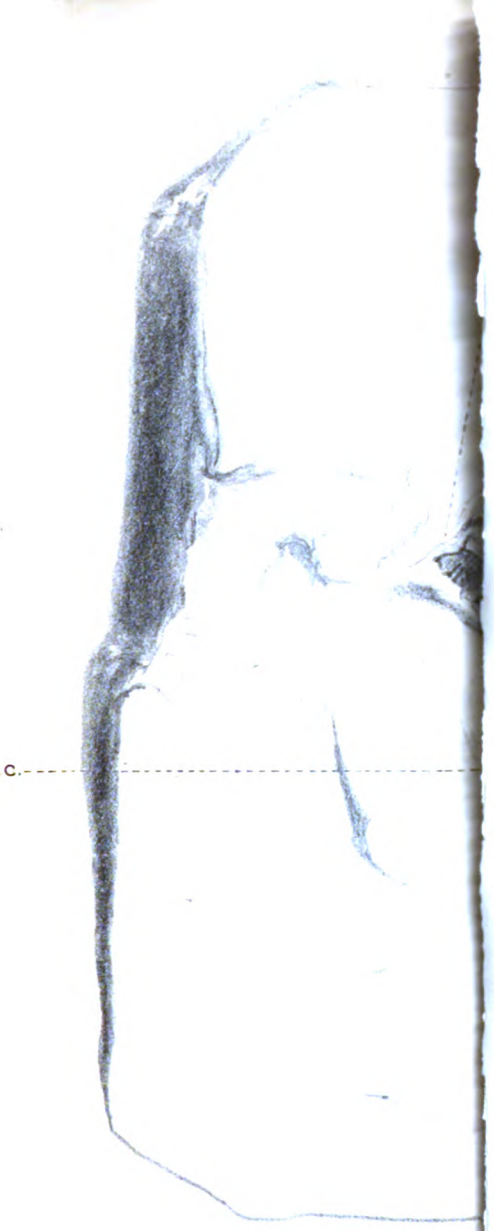

Montagu Browne del. et lith. ad nat.

Some bones

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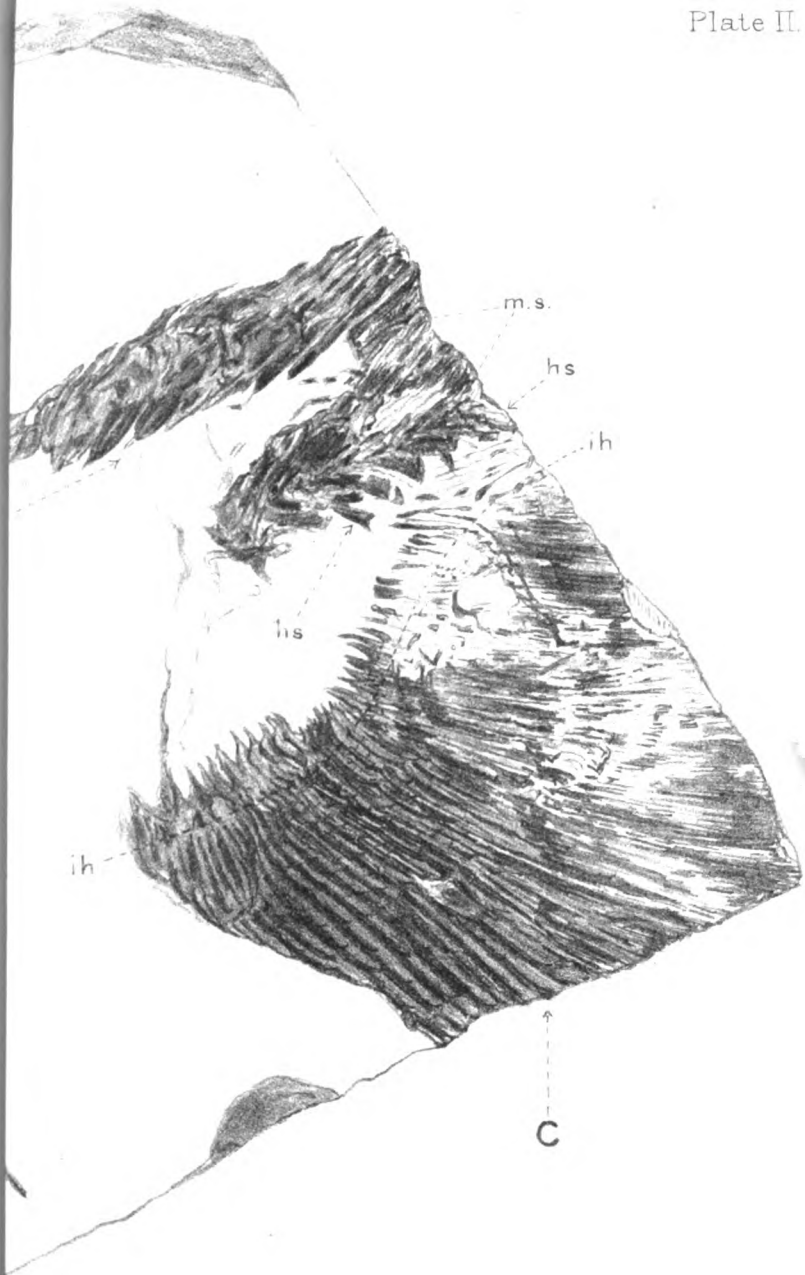

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them from the predatory Saurians and larger fishes with which they co-existed; they required neither defensive armour nor locomotive energy for self-preservation in the fulfilment of those special functions assigned to them in this ancient ocean, although probably of the same nature as those performed now by the surviving representatives of the family."*

Granting the entire nakedness of *Chondrosteus*—in itself problematical if we take into consideration the scutes of the sturgeon-like tail—I should much doubt if that nakedness of the skin, resulting in an assimilation in tint to the liassic mud, would in any case serve to protect it from the carnivorous *Ichthyopterygia* and other Saurians, who were presumably, judging by the anatomy of their eye and its surroundings, much more "wide awake" than the poor defenceless *Chondrosteus*, whose powerful tail might nevertheless place it beyond reach of its enemies, for in this extraordinarily developed organ of propulsion no want of 'locomotive energy' (*vide* Egerton) is apparent.

In conclusion, it is not too much to say that, but for the generosity of Messrs. Ellis and Sons, and the aid rendered to me by their courteous manager, Mr. John Raven, *Chondrosteus acipenseroides* would still have been known only from one spot on the globe, and Barrow-on-Soar would not have shared the honours with Lyme Regis, its only previously recorded habitat since its first discovery there—some fifty years ago.

Postscript.—Since the foregoing was printed, Dr. Traquair has had an opportunity of examining the fossil figured on plate I., and thinks it may admit of another interpretation, being inclined to consider the bone marked *Sq.*, as the clavicle of the left side. The other bones marked *F.* and *P.f.* may in that case also belong to the shoulder-girdle, but are very difficult to satisfactorily determine.

* 'On *Chondrosteus*,' pp. 884-5, op. cit. See also Owen's 'Palæontology,' page 152.

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A NOTE UPON "ROMOLA."

By C. J. Billson, M.A. (Read before Section "A.")

The great and abiding value of "Romola" is, perhaps, rather philosophical than purely artistic. It is, of course, an admirable story, with a most interesting plot and many highly dramatic incidents, but we feel that the paramount excellence of the book consists not in these things, but in its ethical analysis. Indeed, judged technically as a pure work of art, "Romola" shows undoubtedly some traces of the 'prentice hand: as a pure work of art I should certainly place it below "The Mill on the Floss," or "Silas Marner"; but, as a living revelation of the methods of human nature, I should rank it with the great master-works of imaginative literature.

When the book was published, the critics objected to the historical setting of the story, because, as they thought, it handicapped the writer in her delineation of character. The objection seems to me a sound one, but on a different ground. I do not think that it handicapped the writer, but I am sure that it handicaps many of her readers. In the elaborate, not to say laboured, reproduction of Florentine life at the end of the fifteenth century, there is undoubtedly, especially in the first volume, a certain suspicion of feminine pedantry, which often ties the wings of the story. I have no doubt that the chapter describing so minutely the quarrel between Scala and Politian has made many fairly intelligent people close the book in despair; fairly intelligent people have sometimes confessed to me that they could not get through the book. Not that the local and historical colouring is not admirably done; on the contrary, it is too admirable—at every page one wearies of thinking "how admirable these details are!" Now in "Ivanhoe" or "The Talisman" the local and historical colouring is also admirable, but somehow the Great Wizard never obtrudes it upon our admiration. The Master of Romance never poses. In this novel George Eliot certainly does seem to pose now and then as that rare product of civilization—an educated woman. Or perhaps that is an uncharitable heightening of the truth, the fact being that she merely displays, in a somewhat exasperating form, the feminine patience for minutiæ. One cannot help feeling that the sole emphasis given to the Florentine setting by the beautiful Proem is a mistake; unless it be read in conjunction with the far more beautiful Epilogue, which ignores the accidental form and lays bare the actual heart of the book.

But to turn away from these artistic blemishes, which are, after all, scarcely perceptible cloudlets in the splendid moral glow which suffuses the book, let us consider with more reverential criticism its religious and

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ethical meaning. Here indeed is no pedantry; the firm grasp of Aristotelian morals is the mark not of a mere disciple, but of a spirit akin to that of Aristotle; while the vivid moral enthusiasm is not that of the Greek student, but of the true-hearted English lady. The value of "Romola" does not come from its containing any new ethical revelation, but from its being an unusually thorough dramatic representation of the slow and blind movements of spiritual development. It is an artistic rendering of the Ethics of Aristotle which clothes the old bones with new flesh and blood, and comes home to us as Aristotle never can. "Virtue and vice," said Aristotle, "are habits; and we have control only over the beginnings of our habits, the gradual growth of particular tendencies being imperceptible in the moral as in the physical organism." This is the text of "Romola." George Eliot has taken two characters, the beginnings of whose habits are in direct contrast, and has endeavoured to make perceptible by her analysis their gradual growth and divergence. Tito and Romola have, when the story opens, past histories which are outwardly similar, but inwardly most unlike. While Tito, by his acquiescence in his adopted father's will, has been merely cushioning the world for himself, the self-sacrificing loyalty of Romola to her father for his own sake has been preparing her future greatness; it has been to her "a long seed-time without a harvest, in which the larger possibilities of her nature lay folded and crushed like embryonic wings." The politic self-seeking of Tito in his filial relation is the seed from which springs in the end a harvest of disloyalty and crime; the unselfish love of Romola dominates all her life, being gradually sublimated, through loyalty to the dead, into a fellow-feeling for her Florentine citizens, and thence into the supreme love of humanity which is inseparable from the love of God. The point of divergence is reached in the chapter bearing the significant title, "Fruit is Seed." But in the very opening of the story there are dramatic foreglimpses of the end. Thus Romola first crosses the page as "a glimmering of something bright"; while the penetrating old painter wants to paint Tito as the traitor Simon. The rise of Romola and the fall of Tito are effected through temptations which are, like most temptations, extremely subtle.

I once saw in Vienna, what I certainly never expected to see, a really poetical ballet. A knight was watching his armour in a churchyard by night. While he sat there, the stage brightened suddenly, and up from the tombs sprang a bevy of laughing girls, who circled round the watcher with goblets of wine in their hands, from which they vainly sought to make him drink. Upon their retirement, another band of damsels came tripping up, bearing dice-boxes, with which they tempted the knight to gamble, but with no success. Last of all, one beautiful girl appeared alone and danced before him, and made love to him, and she finally overcame his resolution. He sprang up and kissed her, and as he did so there was a clap of thunder, and the stage again became dark, and the faithless knight was left alone in the deserted churchyard with his broken vow.

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Now I think that Tito would have resisted any such palpable and deliberate form of temptation as this. His emotional nature is so shallow, that whenever his keen intellect is ranged against it, the intellect wins. What beats him is the slow convergence of facts. He ignores "the dreadful vitality of deeds," and no one is more surprised than himself when he first denies his father.

"'Who is it?' they ask, when the escaped prisoner grasps his arm.

"'*Some madman, surely,*' said Tito. He hardly knew how the words had come to his lips; there are moments when our passions speak and decide for us, and we seem to stand by and wonder. They carry in them an inspiration of crime that in one instant does the work of long premeditation." Tito, with all his cleverness, had never taken into account this "inspiration of crime," this vitality of habit. He did not recognize the great truth that we have control only over the beginnings of our habits.

The temptations of Romola are, as befits her character, not ignoble. She is tempted to desert husband and home and city on an impulse of sudden disillusionment, and before she is ripe for the larger love. And it may be remarked as an instance of George Eliot's profound insight into human nature that Tito's love for Romola lasts longer than her love for him; the reason being that Romola's love rests upon the true foundation of love, trust, and she ceases to love Tito on the very instant when that foundation is taken away. Tito's love for Romola, however, is based upon his own need of her, and he ceases to love her only "when she ceases to be a necessary part of the furniture of his life."

When Romola is tempted to desert her husband against her own true principles of duty, she is saved for higher purposes by one who interprets to her those deep-seated principles. Savonarola is no *deus ex machina*. He was there to save Tito, too—there is always a Savonarola at hand—but the Savonarolas of the world can never ignite the heart of any man; they can but fan into a clear flame the existing spark, and Tito's heart was cold to all the higher influences. To the heart of Romola, already warm with human affections, and blindly anxious to make some sort of spiritual capital out of her trouble, Savonarola can and does appeal. The very possibility of Savonarola's influence has been prepared by her past life, just as it has been destroyed by Tito's.

When Romola leaves her husband the second time, circumstances have changed. The life of this new Antigone has reached a point where compliance with the outward law means disobedience to the inner conscience. The influence of Savonarola has done its work; she has outgrown it. He had said, "The cause of my party is the cause of God's kingdom"; and this narrowness of insight had alienated Romola as much as his moral depth had formerly attracted her. And this time Romola finds no visible guardian angel to direct her steps; she commits

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herself to the infinite sea, as to the Invisible Goodness; and once more she is saved for noble work. For facts, which always fight against Tito, seem always to fight for Romola, and this is because Tito is dependent upon facts, but Romola is not. In truth, she has enlisted facts on her side by never seeking that they should happen as she would choose them; but Tito, by wanting facts to suit him always, has inevitably set them against him.

In concluding this note, allow me to quote from this noble book one or two sentences which seem to me to bear that stamp of unquestionableness which is the hall-mark of genius. Is not this a true saying?

"The human soul is hospitable, and will entertain conflicting sentiments and contradictory opinions with much impartiality."

And this—"The eager theorizing of ages is compressed, as in a seed, in the momentary want of a single mind."

And here is the conclusion of the whole matter:—

"Our deeds are like children that are born to us: they live and act apart from our will. Nay, children may be strangled, but deeds never; they have an indestructible life, both in and out of our consciousness."

And finally, has any moralist ever described that nameless end of life which we can all feel but none describe, in more wise and simple words than these:—

"It is only a poor sort of happiness that could ever come by caring very much about our own narrow pleasures. We can only have the highest happiness, such as goes along with being a great man, by having wide thoughts and much feeling for the rest of the world as well as ourselves; and this sort of happiness often brings so much pain with it, that we can only tell it from pain by its being what we would choose before everything else, because our souls see it is good.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

This Section has not met during the summer quarter.

T. CARTER, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

June 19, 1889.—Mr. CARTER reported that a party of the Members visited the Abbey Park last week to inspect the progress of the Botanical Garden in course of preparation there by Mr. BURN. It was somewhat advanced since the last visit of the Section, but the classified beds were still unplanted.

Exhibition of Aphides.—Specimens of several species were shown by Rev. T. A. PRESTON, Mr. PALMER, Mr. VICE, and the CHAIRMAN.

Dr. FINCH exhibited some interesting dried plants gathered near Peterborough, viz. :—*Aceras anthropophora*, *Hippocrepis comosa*, &c., also *Gnaphalium germanicum*, called "Herb impious," because the younger flowers always lift their heads above the elder ones.

Rev. T. A. PRESTON exhibited a number of fresh flowers of various hardy exotic *Geraniums* from his garden.

The CHAIRMAN exhibited living plants in flower of the Musk Orchis, *Herminium monorchis*, from Gloucestershire, and distributed dried specimens of *Anthriscus cerefolium.*

Paper. Mr. W. A. VICE read an interesting and valuable paper on "House Flies" of which he said that there were eight or nine species frequently found in our houses, several of them very much alike in appearance, but differing in such minute points as the nervation of the wings, the plumosity of the antennæ, &c. WALKER'S "Insecta Britannica" was the chief work of reference on the subject for English students.

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July 17, 1889.—The CHAIRMAN reported that the Excursion last week to Mountsorrel and Buddon was a failure. Only Miss ANDERSON and himself turned up at the rendezvous, and as the morning had been wet and the sky was still threatening, they gave it up. He further reported that he had visited the lake in the Abbey Park, and found there an enormous growth of *Chara fœtida*, which was choking the lake and had been dredged out, also *Potamogeton zosterifolius* and the curious filamentous Alga *Mesocarpa pleurocarpus*.

Exhibition of Germinating Seeds.—A number of seedling plants were exhibited by Miss HOTTINGER, the CHAIRMAN and others, showing variations in the form and persistence of the cotyledons. The CHAIRMAN explained that the division of seeds into *albuminous* and *exalbuminous* was now considered old-fashioned and out of date, what used to be called *albumen* (in seeds) was now called *Endosperm*. This occurred in the seeds of all phanerogams, and was only more or less absorbed by the embryo at the time when the seed was ripe. Cotyledons which have absorbed all the endosperm and thus become thick and fleshy, as in the Bean and Acorn, remain underground when the seed germinates, while those which have only partially absorbed it, and are therefore thin, generally appear above ground as the first seed leaves.

Miss HOTTINGER exhibited some of the large yellow flowers of *Centaurea macrocephala*; Mr. KNOWLES, a flowering spray of *Cobæa scandens*; Dr. COOPER specimens of *Vicia lutea* and *Trifolium maritimum*, two rare British plants; Mr. GRUNDY, *Epipactis latifolia*, and *Eriophorum angustifolium*; Mr. BOUSKELL, *Chlora*, *Echium* and *Calamintha Acinos*, from Gloucestershire; The CHAIRMAN, a drawing of *Cladophora flarescens* a filamentous Alga, become troublesome in the Water Reservoirs, but not observed there previously, and a new county record.

The CHAIRMAN introduced a brief discussion upon Darwin's theory of *Pangenesis*, which he said was an attempt to account for the remarkable phenomena of heredity. Previous thinkers had suggested similar views, on which Darwin's theory was thought to be an improvement. It assumed that every organic cell was continually giving off extremely minute molecules of precisely similar structure and character as the mother cell itself, and that these became aggregated in the reproductive organs, not promiscuously, but according to some occult affinities, thus producing in the offspring certain of the characters of the parents, but not the whole of them.

In August the Section did not meet.

F. T. MOTT, *Chairman*.

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SECTION "E."

FOR ZOOLOGY.

June 3.—In the absence of the CHAIRMAN, Mr. W. P. PYCRAFT presided.

Mr. G. H. STORER read some notes on the habits of the Smooth Blenny *(Blennius pholis)*, and Viviparous Blenny *(Zoarces viviparus)*.

In the course of his remarks he alluded to the abundance of the first-named species amongst fucus in rock caves on the South coast, where, at low water, they might be observed to leave their hiding places in order to bask in the sun's rays upon the rocks left bare by the retreating tide. When in confinement they were found to be sure tide indicators, mounting a pyramid of stones erected in the middle of the aquarium with commendable regularity, precisely at low water.

This peculiarity was also noted as occurring in an allied genus *Salarias*, East Indian fishes, the members of which "climb with ease very steep surfaces and dart about the rocks, with the agility of lizards, in pursuit of flies." In allusion to this habit, one of them, *S. tridactylus*, was popularly known as the "Jumper."

The characteristics and distribution of the Viviparous Blenny were next noticed, Mr. STORER stating that this fish seemed to prefer more Northern regions, being found not uncommonly off the coast of Northumberland, occuring also on our Southern coasts as a generally rare species.

A discussion followed in which several members took part, after which a vote of thanks to Mr. STORER was carried unanimously, on the proposition of Mr. W. P. PYCRAFT, seconded by Mr. W. A. VICE.

Mr. H. E. QUILTER followed with a short communication dealing with some specimens of Leicestershire Myriapoda, and exhibited, in conjunction with Mr. W. A. VICE, a number of specimens of members of the class, both British and Foreign.

Other Exhibits were :—Case containing specimens of *Blennius pholis* from Hastings, and *Zoarces viviparus* from Norway, by Mr. G. H. STORER.

Various Lepidoptera, by Messrs. F. BOUSKELL and B. HEADLY.

June 29.—A small party of Members visited Wistow Park where a very pleasant afternoon was spent, several interesting captures being made in the Park and in the lake adjoining the house. The small attendance was a regrettable incident inasmuch as the whole of the Park and grounds had been thrown open for the inspection of the Members through the kindness of Sir HENRY HALFORD, Bart, to whom a hearty vote of thanks was passed before leaving for home.

July 15.—In the absence of the CHAIRMAN, Mr. L. HODGES was unanimously voted to the Chair.

A discussion was introduced as to the advisability of effecting an amalgamation between Sections "C" and "E," the former of these having practically ceased to exist as an independent Section. The Secretary read three letters bearing on the subject, and the CHAIRMAN (Mr. HODGES), and Mr. MONTAGU BROWNE subsequently spoke in favour

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of the scheme. On the proposition of the SECRETARY, it was finally decided to refer the matter to a specially convened Meeting to be held some time in October, the exact date being left to his discretion to determine.

Mr. WALTER LEE was elected an Associate of the Section on the proposition of Mr. W. P. PYCRAFT, seconded by Mr. MONTAGU BROWNE, who also proposed the first Corresponding Member of the Section, viz.: Rev. A. SPARKES of Cordova, S. America. Mr. H. E. QUILTER seconded this proposition, which was carried unanimously.

Mr. MONTAGU BROWNE then read a paper entitled "On a Fossil Fish, *Chondrosteus*, from Barrow-on-Soar, hitherto recorded only from Lyme Regis." (Printed at page 17).

At the conclusion of the paper the usual vote of thanks was tendered to Mr. BROWNE.

Exhibits.—Specimen of Chondrosteus from the lower lias of Barrow-on-Soar, with a life-size restoration of the fish, by Mr. MONTAGU BROWNE.

September 2.—Mr. E. PATTISON took the Chair in the absence of the CHAIRMAN.

Messrs. A. BAKER and F. SNAITH were elected Associates of the Section on the proposition of Mr. H. E. QUILTER, seconded by the CHAIRMAN.

Mr. H. E. QUILTER then read a paper on "Centipedes and Millipedes."

After some introductory remarks in which a comparison was instituted between marine annelids and the terrestrial myriapoda, Mr. QUILTER proceeded to sketch the general structure of the members of the class, pointing out the distinguishing characteristics of the orders *Chilognatha* and *Chilopoda*. This was followed by a brief but interesting notice of the mode of development in *Julus*, attention being specially directed to the early history of the limbs with the relations existing between them and the corresponding members in the class Insecta. In conclusion, a list of the following Leicestershire species was given, the specimens having been collected by Mr. W. A. VICE and Mr. QUILTER, and named by Mr. T. D. GIBSON CARMICHAEL.

GLOMERIS MARGINATA. *Villers.*
BLANIULUS VERMESTUS. *Meivert.*
JULUS FALLAX. *Meivert.*
„ SABULOSUS ? (inmature specimen).
LITHOBIUS FORFICATUS. *L.*
„ VARIEGATUS. *Newport.*
GEOPHILUS FERRUGINEUS. *Koch.*
SCOLIOPLANES ACUMINATUS. *Koch.*
POLYDESMUS COMPLANATUS. *L*

A short discussion followed, after which, a vote of thanks was passed to Mr. QUILTER.

Exhibits.—Specimens of British and Foreign Myriapoda, by Messrs. W. A. VICE and H. E. QUILTER.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1889.

Oct. 7.—INAUGURAL ADDRESS of the PRESIDENT.

,, 21.—CARL ARMBRUSTER, Esq. "*The Life, Theory, and Works of Richard Wagner*," with numerous Vocal and Instrumental Illustrations.

Vocalist—Miss PAULINE CRAMER. *Pianoforte*—The LECTURER.

N.B.—This Lecture will be given in the Temperance Hall.

Nov. 4.—CANON CREIGHTON, of Worcester. "*The coming of the Friars.*"

,, 18.—A. H. PAGET, Esq. Recital from "*As You Like it.*"

Dec. 2.—Mrs. HENRY FAWCETT. "*John Wiclif and the Dawn of the Reformation in England.*"

,, 16.—HENRY NEVINSON, Esq., M.A, "*Robert Browning.*"

1890.

Jan. 13.—Professor W. H. FLOWER, C.B., LL.D., F.R.S., &c. (President of the British Association). "*Pigmies.*"

,, 27.—F. M. POPE, Esq., M.B. "*Dreams.*"

Feb. 10.—Rev. STOPFORD A. BROOKE, M.A.

,, 24.—CHARLES J. BILLSON, Esq., M.A. "*The English Novel.*"

Mar. 10.—FRANK E. BEDDARD, Esq., M.A. (Prosector to the Zoological Society of London, and Davis Lecturer). "*The Colours of Animals.*"

,, 24.—G. R. KIRWAN, Esq., M.A. "*Early Elizabethan Dramatists.*"

Arrangements have also been made for a Lecture to be given by

Mr. H. M. STANLEY,

Upon his recent adventures in Africa; but the date of this Lecture cannot be fixed until Mr. STANLEY'S return.

The Right Honourable JOHN MORLEY, M.P., has also been asked to Lecture during the Session upon some literary subject, but it is at present uncertain whether his other engagements will allow him to come.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. THOMAS CARTER, Mill Hill House.

Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

Tuesday, Oct. 15.—The CHAIRMAN. "*Characteristics of Savage Life.*"

,, Nov. 19.—Mr. WM. SIMPSON. "*Shakespeare's Jesters.*"

,, Dec. 17.—Mr. T. H. FOSBROOKE. "*Ashby Castle.*"

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SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at the Museum, at 7 p.m.

Oct. 16.—1. Exhibition of Fungi, and of Autumnal foliage.

2. Paper on "*The Linnæan and Natural Systems of Classification*," by the Rev. T. A. PRESTON, M.A.

Nov. 20.—1. Exhibition of Bird Skins.

2. Paper on "*The Preservation of Bird Skins*," by Mr. G. H. STORER.

Dec. 18.—1. Exhibition of *Coleopterous Insects.*

2. Paper on "*Spiders*," by the Rev. W. AGAR.

SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

Oct. 14.—Paper by the CHAIRMAN.—"*The Fore-limb of Vertebrates*" (Illustrated by specimens and diagrams).

Nov. 11.—Paper by Mr. C. J. BOND, F.R.C.S.—"*The changes in an Egg during Incubation*," (Illustrated by specimens and diagrams).

Dec. 9.—Paper by Mr. MONTAGU BROWNE, F.Z.S.—"*A contribution to the history of the Lias and Rhætics in Leicestershire*," (Illustrated by specimens).

The paper for the evening will be read at 7.45 ; any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,

Chairman, T. CARTER, LL.B.

Secretary, JNO. SCAMPTON,
1, Pelham Street.

D. BIOLOGY, (BOTANY AND ZOOLOGY).

Chairman, F. T. MOTT, F.R.G.S.

Secretary, J. J. W. KNOWLES,
St Stephen's Road.

E. ZOOLOGY, (With which is amalgamated Section **C.** GEOLOGY).

Chairman, F. M. POPE, M.B.

Secretary, F. R. ROWLEY,
Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1889-90.

OCTOBER, 1889—JANUARY, 1890.

GENERAL MEETINGS.

October 7th, 1889.—Inaugural Address of the PRESIDENT (J. D. PAUL, Esq., F.G.S.). Printed at page 59.

October 21st.—CARL ARMBRUSTER, Esq., on "The Life, Theory, and Works of Richard Wagner. (Professional.)

This Lecture was given in the Temperance Hall.

The LECTURER said that Wagner was one of the greatest musical composers of all time—a man whose name was revered by the entire musical world as one of the greatest geniuses that ever lived. If they surveyed the whole of his life and works the result would be most elevating and important. It was impossible to state in a few sentences all that Wagner had been. One might write whole books about him in his capacity of musical reformer: each one of his works was worth the most minute study of detail, and in each one the poet Wagner claimed no less warm a tribute than the composer. His activity as a writer was stupendous, and his letters were highly attractive. He always convinced a reader who read without prejudice, and proved his points with certainty. Always a sworn enemy of narrow-mindedness he invariably called things by their right names. He supposed that every artist was imbued with the same zeal, enthusiasm, the same inner yearning for the highest ideal in art which animated himself during the whole of his life, and he remained true to that ideal with all the fervour of his soul. With the precision of a strategist directing battles he worked out his artistic plans; relying on his own zeal, his creative genius helped him to victory everywhere. Wagner confined himself to the development of the musical drama, seeing in that the climax, not only of the musical art, but also of dramatic representation and poetry. His great theory was that in a perfect musical drama, the three arts—poetry, music, and scenic representation—should be welded together into one well-balanced whole, neither of the three preponderating, but each supporting, amplifying, and intensifying the other two. He formed that theory because in the musical dramas of his time he found that those conditions were not fulfilled, in the operas previously published there being frequent incongruity either on account of the unintelligibility of the libretto, or owing to the pettiness of the subject, the music simply crushing it. Volumes had been written for and against Wagner's theory, but the battle was now over, and his theory had been victorious on all points, wherever his works had been adequately performed.

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Dealing with the principal incidents in his career, the lecturer remarked that Wagner was not an "infant phenomenon," nor were they greatly in favour with him. In Germany they were known as "wonder children," and it was generally found that as they grew up the wonder went and the children remained. Following the student from his home to Paris, he remarked that he was here patronised by Meyerbeer, to whom he had a letter of introduction, so much that he nearly starved. From Paris he went to Dresden, where "Rienzi" and the "Flying Dutchman" were produced, and "Tannhäuser" was sketched in 1845. The success of the latter two works was not so great as that of the former, as the public did not understand his style, and had not been educated up to it. The Lecturer briefly detailed the circumstances under which Wagner's other important works were composed, and dwelling on his short residence in London in 1855, when he was invited to conduct the concerts of the Philharmonic Society, said that he was not received there by the Press in a particularly hospitable manner. In the orchestra of the Society he found the traditions of the previous directors reigned supreme, and he had great difficulties to contend with before getting the orchestra up to his own ideas. He conducted eight concerts there in all, and the last brought him an enthusiastic ovation from the audience and the members of the orchestra, and some gracious compliments from the Queen.

In 1863 he travelled through Europe, conducting orchestral concerts with brilliant outward success, but very little from a pecuniary point of view, and it was then, when the cloud which hung over him seemed thickest, that he received, in May, 1864, the call from the late King of Bavaria. By the favour of that monarch Wagner was relieved of his pressing cares, and was able to complete his greater works. "Parsifal," the last of his operas, was finished in 1882, and performed at Bayreuth before a number of crowned heads, and repeated 15 times. In September of that year he went to Venice for rest, and there died suddenly in the following February.

Now that his career was ended, they must own that in the career of no other musician, perhaps with the exception of Beethoven, could they observe such a continued progress in the style of his works, with a musical theory as regularly carried out, after being developed, as in his. He recognised the fact that he could never reach artistic independence if he persisted in the style of the work of his earlier life, and in latter years he stigmatised "Rienzi" as an error of his youth. In spite of all the success he obtained by it, he left that style and turned to the new ways in "The Flying Dutchman." The declamation in that opera was more powerful than in "Rienzi." At the same time they met another device, his use of so-called leading *motifs*, which were short and pregnant musical phrases, that pourtrayed the various persons of the drama. Those leading *motifs* appeared again and again in the orchestral accompaniments to his latter works, and they were often found in the vocal parts as well, and eventually that characteristic was carried out to its fullest extent, and it

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was due to that fact that Wagner's music was always so wonderfully impressive.

The lecturer next pointed out the close relations of the character of Wagner's music with the sentiments of the opera, and submitted that in his poetry they would not find common-sense outraged by absurd contortions of language; and then, with the assistance of Miss Pauline Cramer, proceeded to illustrate some of the earlier operas. He remarked that he was under a disadvantage in being without a full orchestra, as in orchestral effects Wagner was not equalled, and the works of no composer suffered so much from being transferred to the piano as did his.

Selections were given from "The Flying Dutchman," "Tannhäuser," "Lohengrin," and "Tristan und Isolde." Miss Cramer gave a very spirited and powerful rendering of some of the most difficult and characteristic ballads and arias from these works, and the lecturer himself exhibited the beauty of the score so far as was possible on the instrument—a grand piano—at his disposal, the result being a highly entertaining and instructive lecture.

November 4th.—Canon CREIGHTON, of Worcester, on "The Coming of the Friars."

The LECTURER said his subject might perhaps best be defined as the Reformation of the 13th century. All reforming movements might be classified under three main divisions. One class of reforms aimed at furbishing up existing machinery, another owed its strength to the fact that it introduced new and fruitful ideas, and the third class cleared away the lumber of the past. The reform to which he was going to call attention brought before them instances of all three processes, and would enable them to understand corresponding processes as they went on at the present day. The 13th century was, with the exception of the present, far the grandest and most splendid in modern history. Never were there so many great men, never was there such great activity or so many noble ideas exhibited in the world and clothed with actual power. The greatest of those movements and the noblest of those ideas was that with which he was concerned. On the one side it aimed at letting loose on the world new ideas, and on the other side it aimed at that part of reformation which he described as the furbishing up of old machinery and the revivifying of old institutions. It was a source of interest to see how those two movements, starting on their separate planes, intensified and helped one another until they worked with an almost irresistible force. The world was moved, not by the great folks on the earth, but by the little ones, by those who felt within them an overpowering impulse to express the truth which was part of their own moral being. That thought was adapted to dignify the aspect of life to each one of them. If things were to be done they might be done by any unknown and obscure person, and were more likely to be done by him than by legislative interference, or by great schemes or operations conducted upon a large scale.

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In the 13th century there was a restless spirit abroad. Old institutions seemed to have become feeble. The Church had lost its hold upon people's minds. There was disorder upon every side, and wild ideas were loose in the world. There had come a sudden outburst of industrial prosperity. The middle-class had risen largely in importance and comfort. The difference between the poor and the rich was very greatly felt, and there were movements of popular dissatisfaction on every side. There was a growth of heretical sects within the Church whose ideas and conceptions were subversive of every fabric of society. On all hands there were difficulties, and the recognised institutions were hepless to cope with them. The breaches in society were then healed, the old institutions received new vigour, and a new moral and spiritual life was introduced into the world by the simple movements of two men who were perfectly obscure, living in different parts of Europe, starting upon their career from quite different standpoints, and yet in the long run converging so as to form one united stream of a popular impulse which swept everything before it, which gave life with a new meaning to the humblest of those living at the time, which regenerated society, revived learning, and created modern art.

The lecturer then gave some interesting details of the origin of the Dominican and Franciscan orders of friars. The founder of the former first recognised that if they wished to teach and influence people they must do so by going down to their level, speaking to them in language which they could understand, meeting them as man meets man rather than as a teacher meets a disciple. Dominic gradually formed a small band of 16, but it took him nine years to do it, and they grew into the famous Dominican order, which before its founder's death had penetrated to every country in Europe, founded its houses and sent forth teachers, and had the result of heightening popular education, bringing home to the people ideas which for a long time had been forgotten or overlaid, quickening the standard of intellectual comfort, and regenerating the intellectual life of Europe. The reform of Dominic was of the kind described as the furbishing up of the old machinery—the teaching of the doctrines of the Church as they ought to be taught, but were not taught. If he had not been supported by another movement the Dominicans would have produced their result for a little time, and then would have been absorbed in the common mass of worldly enterprise. But the Dominican movement was supported by a strong impulse from another side, given to it by a man widely different from Dominic—the founder of the Franciscans. This man was notorious as a boy for high spirits and a mischievous disposition. From the age of 19 he displayed extraordinary affection for the poor, so much so that the people were convinced he had become crazy. Ultimately he renounced his father and family, and cut himself adrift from all ties in order that he might work out the ideas he had conceived in his mind. He discarded all worldly goods and wandered forth into the world to preach. His speaking was entirely and utterly simple. He had no notion of teaching anything. There was no intel-

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lectual side to his conceptions, but he aimed only to bring home to the people the fundamental rules on which the life of man was founded. He had no money, but did any kind of work for a livelihood. He was at first thought to be crazy, but ultimately came to be regarded with respect. Little by little others were moved to follow his example, and it was not many years before he had a following of 17 or 18. They made for themselves simple rules, namely, to follow the example of the Apostles, and to put before men the gospel and not the law.

They would understand the friars best if they regarded them as being the dissenters of the middle ages. They never conformed, but were absolutely free and independent. The parish priests might have their services, but the friars preached in the middle of the roads, stood in the market-place, gathered in the villages round the cross, and interfered with the work of the priests in every way. They were absolutely and entirely revolutionary, and quite contrary to all that was respectable. They were said to be disorderly, just in the same sense as the efforts of the dissenters seemed to be disorderly to the rigid Anglicans. Francis then went to the Pope and asked his sanction, which was given. The Pope backed him and his brethren up, which was much the same thing as if the Archbishop of Canterbury became the patron of the Salvation Army, or seemed to be so to the people of the day. The Franciscans, however, lived lives of entire self-denial and poverty. They taught by apt illustration, full of humour and point, and always perfectly clear and intelligible to the meanest capacity. It was those characteristics which won the people and attracted enormous numbers of followers to Francis. Before he died there were 3,000 members of his order in Italy alone, who had given up all things for the purpose of wandering about and doing such jobs as came in their way for the good of others. It seemed beyond their capacity of understanding that within a few years such a vast body of enthusiasm, not superficial, but going down to the basis of human existence, should have been evoked simply by the example of a man who was in no sense intellectual, who had no persuasiveness about him, who had no great idea and no great scheme, and who held before men no attractive prospect—did not even flatter himself that he was doing a great philanthrophic work, but was simply and solely engaged in leading the life, the external forms of which fitted the internal aspirations which he felt awakened in his own breast.

After some time the friars undertook missionary work, going first to Germany. The two orders reacted upon one another. The Dominicans began as an intellectual order They saw that their order could not succeed unless it took the Franciscan basis, and thus they adopted their line, and it was that motive at the bottom of the two orders which gave them their popularity, because it appealed most directly to that which everybody could understand and recognised—the spirit of devoted self-sacrifice. The two orders combined upon that basis and learned one from the other. The Dominicans came to England in 1221 and the Franciscans in 1224. The former made in the first instance for the

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seats of learning, their object being teaching; and when the Franciscans came they were welcomed by the Dominicans settled at Canterbury, who passed them on to London and Oxford. He (the lecturer) did not know when they came to Leicester, but it was in the course of the 13th century, and among their earliest teachers at Oxford were a Thomas and an Adam of Leicester, so that Leicester contributed in the earliest days of the Franciscan order in England two of its most notable teachers at the great centre of learning.

The two orders between them introduced very high notions of humanitarianism. They lived among the people outside the cities in the most squalid conditions, built little churches of the simplest and rudest character, and led the people to higher things and to the knowledge that the way of peace was to come from within. In that way their example was simply the beginning of a new state of things in society. They rapidly won their way into the appreciation of the great folk, and brought together the classes in a way that had never been done before—in a way of dignified poverty. Poverty by their action was made, not a thing to be ashamed of or apologised for, but a thing which was in itself the true nobility of life, the true aristocracy, and it was so recognised. They decorated the interior walls of the churches with frescoes, and thus introduced a new form of art and carried out the most vital conception for the social regeneration of the times, and he would leave it to them to think out whether it was not the vital conception for the regeneration of all times.

November 18th.—A. H. PAGET, Esq. Recital from "As You Like It."

December 2nd.—Mrs. HENRY FAWCETT, on "John Wiclif and the Dawn of the Reformation in England." (Professional.)

Mrs. FAWCETT, after briefly touching upon the Reformer's early life, said the personal character of Wiclif was full of that magnetic charm which so often accompanied true genius. He was especially a friend of the poor, the weak, and the helpless, and he also commanded the love and faithful friendship of the foremost men and women of the day. One secret of his power was his absolute disinterestedness and the beautiful purity of his life. At a time when the whole of society, including the Church, from the Pope downwards, was steeped in an atmosphere, not only of loose morals, but of the foulest licentiousness, Wiclif's life even according to the unwilling testimony of his enemies was pure and blameless. All the venom of his enemies could not produce a single charge against his life.

The lecturer then proceeded at some length to refer to the war between England and France, and the series of events that led to Wiclif's share in political life and his temporary alliance with John of Gaunt, the brother of the Black Prince. Wiclif was at this time preaching against papal supremacy, his great contention being that dominion was

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founded in grace. He could not destroy at once the whole of the monstrous system he was fighting against, but the good seed sown fructified and grew steadily from that hour. Wiclif was convinced that the Church was more in danger by wealth and luxury than by any external foes.

In 1378 Wiclif was summoned to appear before a court of bishops at Lambeth, and nineteen charges of heresy were preferred against him. His reply was a fearless recapitulation of the most famous of his heresies. He again affirmed his belief that dominion was founded in grace; he declared that Church property should be subject to taxation, and should even be taken away from the Church altogether if a right use was not made of it. He also declared that if the Church did not reform itself it was the duty of the laity to reform it, that the spiritual powers of the clergy were conditional on their being exercised in conformity with the will of God. He was willing to defend these opinions even unto death. While the trial was proceeding a message came from the Princess of Wales prohibiting the bishops from taking further action against Wiclif, who once more left his accusers unscathed.

This marked the commencement of an important era in Wiclif's career. It opened those last glorious six years which he devoted to a greater work than any he had yet undertaken. Gregory XI., who restored the Papal Court from Avignon to Rome, died almost immediately after the conclave at Lambeth. Hitherto Wiclif had not broken through the essential doctrines of Papacy, but his old moods now passed away under the influence of new and strange facts. Gregory XI. was succeeded not by one Pope but by two, who were nominated by rival factions, and the spectacle of those two Popes hurling excommunications at each other, and at length waging a bloody war one against the other, struck a terrible blow at the essential doctrines of Papacy. From this time Wiclif took up a new attitude. He cast off the allegiance of Rome, and, in the last six years of his life, he developed the main principles of the Reformation. He now maintained a bold, uncompromising attitude, and entirely threw off the doctrine of intellectual and moral subservience to the Papacy. He denounced image and saint worship, and recommended Christians to stay at home rather than make pilgrimages to the shrines of departed saints. He mocked with stinging sarcasm the pretended celibacy of the clergy, and shewed what a contemptible sham it was; and he denounced unsparingly the doctrine of indulgences. He had little respect for the rite of confirmation, and still less for penance and absolution. The pivot on which all those doctrinal reforms turned was opposition to the central principle of sacerdotalism. He taught that all men and women were individually responsible for the good or evil wrought by them, that the mediation of priests was worse than useless, that personal purity of life was the true ideal, that the doctrine of indulgences simply constituted works of supererogation, and that prayers for the dead were distinctly mischievous. In his concentrated attack on sacerdotalism, he shewed that the root of the

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system rested on the doctrine of transubstantiation, and that the whole of the false and mischievous claim of the priesthood to control and govern mankind, rather than serve it, rested on that supernatural power. He made a powerful attack on this stronghold of the foe, and its lasting effects proved to be the crowning achievement of Wiclif's life. They were told that "Wiclif's attack on the doctrine of transubstantiation was so conclusive that the scholastic conception was shaken to its very foundation." Those last years were indeed the crowning years of a glorious life, and his words breathed forth nothing but confidence, courage and hope.

After his retirement to the Rectory at Lutterworth, he completed his translation of the Bible, which had earned for him the title of the father of English prose.

After Wiclif's death the movement he had inaugurated was severely checked for a time, and during the disastrous hundred years war, and the Wars of the Roses, its moral growth and life were suspended. Yet, in spite of bitter, unrelenting persecution, and the pre-occupation caused by foreign and civil wars, Wiclifism did not die out, and the people clung in secret to the Bible. Thus was the way carefully prepared, and the foundations laid, which led to the advent of Luther and the other Reformers, and the final triumph of Protestantism in England.

December 16th.—HENRY NEVINSON, Esq., M.A., on "Robert Browning."

The LECTURER, at the outset, referred to the recent death of the poet, and said such deaths suggested, of course, solemn thoughts, but he thought not at all melancholy thoughts. Happy in his life, happy in his work, happy in his death, he had left a great work behind him. Happy was Robert Browning, who for 50 years was a marked man before a most inquisitive public, and yet escaped the breath of scandal—that was to say of personal interest. Of Browning it could with truth be said that he kept aloof with innocence. The poet was born in May, 1812, at Camberwell, a pleasant suburban village, in the house of his father, who was a bank clerk of scholarly and classic tastes, and devoted to Junius, Hogarth, and Pope. The Browning family came from Dorset, but the poet's grandmother was a Creole and his mother was of Scotch descent. In early boyhood he was divided in mind whether to become a musician, painter, or poet. At that time, however, Byron was certainly the most prominent figure in England, and it was with the deliberate intention of becoming a second Byron that Browning turned definitely to poetry, and by his 13th year had produced enough Byronic poetry to fill a volume. He determined to train himself as strenuously as Milton or Wordsworth for the calling of poet. After leaving Dulwich School in 1826 and having studied for a very short time at the London University School he settled down to work in hard earnest. In 1834 Browning travelled abroad and visited St. Petersburg, and in the same year he produced the two poems "Johannes Agricola" and "Porphyria's

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Lover," in which the certainty of his future greatness was, for the first time, distinctly proclaimed. The leading characteristics of Browning were more than foreshadowed in each of these poems—the ironic humour, the dramatic perception, the reality of description, the power of situation, and the doctrine that only the complete and ungrudging was of any avail. The Lecturer now proceeded to allude briefly to the principal works of the poet, remarking in reference to his fifteen years' residence in Italy after his marriage, that during this period he published only two books, "Christmas Eve and Easter Day," and "Men and Women," but they contained fifty masterpieces in all—enough to establish the renown of fifty poets. After the death of his wife his poems were characterised generally by increased seriousness of thought, by more definite insistence on the ultimate principles of religious and philosophic belief, by increased complexity of treatment, and in some cases a carelessness of structure, a defiance of the great laws of art, that would permanently diminish the value of many works into which he had thrown his greatest ideas. Truly, however, the poet, who began with the strange and bewildered fragment of "Pauline" had not proved a "barren knave." Those 20 or 30 volumes of his were a literature by themselves; they might be a heroic scholar's life study. Deans and bishops were proud to show that they partially understood the poet whose fame was said, 40 years ago, to have ended in smoke. Setting aside all exaggeration of worship, no one would now hesitate to admit that Mr. Browning would always count as one of the most prominent figures of this century. He had created a literature and a style; he had influenced the thoughts of a large and always increasing number of English people; he had changed their aspect of things; he was full of revelation; he had touched chords of emotion untouched before, and by his touch he had revealed the existence of emotions hitherto unsuspected. There could be no doubt as to his importance in literature. As to the vexed question of Browning's style, it could not be denied that his expression was often very difficult. Browning himself was always quite conscious of this, and of the consequent angry criticisms. The only actual defence he had deigned to give—and that was a boast rather than an apology—was in a letter, where he said he could have little doubt that his writing had been in the main too hard for many, but he had never designedly tried to puzzle people, as some of his critics had supposed; on the other hand, he never pretended to offer such literature as should be a substitute for a cigar or a game at dominoes to an idle man. They could not wonder then that people who for the most part did regard poetry as such a substitute should have been repelled by Browning's unruly measures and unheard-of themes. But, as a matter of fact, out of all those volumes there were only five or six poems in which the whole scope and purpose remained obscure without patient and exacting study. At the same time there was often considerable difficulty in parts of many other of the poems, sometimes arising necessarily from the obscurity or remoteness of the subject. Concluding an eloquent and deeply-interesting

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lecture, Mr. Nevinson said Browning always insisted on his belief, was always on the positive side, and kept doubts and negations to himself. That was what gave his work such power and solidity. He was manly, substantial, and steadfast, and utterly free from the sentimental cynicism which pervaded the world under the Titanic influence of Byron. Throughout all his works they did not find a single tone of self-pity for blighted affections and wounded susceptibilities: not a touch of that gloomy rage against things in general, that distinguished scorn and defiance of paltry mankind, which looked so becoming on the stage or in the mirror. In this manliness, this determined serenity, this fixed resolve not to write the literature of damnation, Browning might be regarded as the natural successor of Wordsworth. "There is a tide in the affairs of men," and because Browning from the first was strong enough to take the tide at flood he had enjoyed the fruition of work accomplished.

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PRESIDENT'S ADDRESS.

The PRESIDENT said:—

It has pleased the Council of this Society to confer upon me the distinguished honour of electing me to the office of President. My first words must be my thanks to them, and my next to ask from them and from our Officers, to whom I can assure you we owe much more than is generally known, and also to ask from you all, that assistance and co-operation which will be necessary to add another to the many prosperous and useful years of our Society.

The Leicester Literary and Philosophical Society has lived so long that it is now possible to detect upon it those signs of age which mark our ancient institutions. The circumstances and the conditions which surround it to-day differ widely from those which attended its foundation. New ideas prevail. New words are used to express them, or old words have been impressed to carry new meanings. For an illustration of such changes, we need look no farther than the style and title of our Society. We call ourselves a Literary and Philosophical Society. The words "Literature" and "Literary" mean to-day pretty much what they have always meant. Literature is the history of the actions and passions of men, and consists of the best which has been written on all that interests mankind. So far for the first half of our title, but what do we mean when we call ourselves a "Philosophical Society"? We ought to be ready with an answer to this question.

At different times, the words "Philosopher" and "Philosophical" have carried very different meanings. We must not stay to admire or examine the description of a philosopher by the greatest idealist the world has ever listened to. Many of you will recall the passage in the "Republic." We must pass by as well the wonderfully modern definition of philosophy given by Cicero. Putting these on one side, let us try to recover what our founders meant when they decided, doubtless after due deliberation, to appear before the world as a Philosophical Society. There should be no great difficulty in satisfying ourselves on this point. If you will turn back to the addresses of the first two Presidents, you will find that they both mention Bacon by name, and if you will read a little between the lines, you cannot fail to be convinced that they both wrote under the influence of his teaching. Taking up his book upon the "Advancement of Learning," we can scarcely run our eye over a single page without meeting with the word "philosophy," and he has left us in no doubt as to the meaning he attached to it. He sets this out very clearly in the fifth chapter of the well-known second book, where he groups all knowledge under the two heads of Divinity and Philosophy, "the one inspired by divine revelation, the other informed by the light of nature."

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I cannot stop to point out to you the importance of this division, I need only remark that for excellent reasons our founders decided that their Society should not meddle with Divinity. They retained, then, under the name of Philosophy according to Baconian definitions, the whole field of human knowledge. Natural history, the account of animals and plants—what we now call biology, natural philosophy or physics, mathematics, mental and moral philosophy; all these he collected under the head of philosophy, and he laid it down that they were all branches of a tree whose stem or trunk was a primary or universal philosophy, which, he taught, consisted of "all such profitable observations and axioms as fall not within the compass of any of the special parts of philosophy or sciences, but are more common and of a higher stage." I would ask you to note here particularly that he distinctly teaches the great truth of the unity of all knowledge, and the possibility and desirability of marshalling it all under one great system, and that now, after centuries of enquiry and progress, his doctrine is neither incomplete nor antiquated.

We should have been saved a great deal of confusion and uncertainty if it had been possible to retain Bacon's names for the different branches of knowledge. But, unfortunately, the expressions—"Natural History," "Natural Philosophy," offended against a law which the public insists upon enforcing, that no cumbersome names shall be long repeated without incurring the penalty of curtailment or disuse. Latterly, for this and other reasons, little but indignity and misfortune have attended the words philosopher and philosophical. The Royal Society began by countenancing the restriction of the terms to experimental science, and their Reports, which are filled with accounts of scientific research, are still published under the title of "Philosophical Transactions." Whilst the makers of telescopes, microscopes, and the queerly-shaped bottles used in the laboratories of Chemists, still advertise their wares as "philosophical apparatus."

On the other hand, the departments of Bacon's philosophy such as natural philosophy, natural history, and others, have ceased to call themselves branches of philosophy, and have set up as an independent kingdom, under the name of science. Almost the whole of the field which Bacon included under the name of philosophy has been parcelled out into these modern divisions. Thus we have the science of living things, biology, of dynamics, of history, of morals, of sociology, and in these last days we have the science of religions. So far has this transformation proceeded, that, to most people, philosophy means now little more than what Bacon set down under the heading of that primary and universal philosophy which was the trunk or stem from which sprang all the other branches of knowledge. Many persons have supposed that our title indicates that it was the intention of our founders to restrict the work of the Society to these higher studies. It is due to them that we should vindicate them from such an unfounded charge. Obedient to the authority and teaching of the father of English philosophy, they selected

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a name for their new Society which stands as evidence of their wise, their large, their liberal ideas. We are proud of our predecessors. We have nothing to alter, nothing to amend, and we can do no better than carry on the work of the Society upon the lines which they laid down.

I am quite aware that I ought not to expect to escape the reproach that I have occupied your time with remarks on the comparatively trivial, and if the truth must be spoken, the uninteresting history of words only. Allow me to remind you that these changes in the use and meaning of words are the signs and the evidence of changes in the beliefs which affect and control our lives. The changes we have referred to really mark the advent of a new age—the age of science—an age in which we try to solve all problems by scientific methods. We look at the world from the point of view of science, and we deny or we are apt to forget that anything goes on in the world which cannot be counted and measured and stated in the terms of science. The outburst of scientific discovery and the increased public interest in the study of science are, in truth, the most striking characteristics of the last half century. Generations may pass away before the world again listens to the enunciation of theories like those of evolution and the survival of the fittest, which have revolutionised so many sciences, and profoundly altered our way of looking at so many questions of every-day life.

Think again of the influence of another series of scientific discoveries, those which we connect with the names of Faraday and Helmholtz. Half a century ago the world still afforded some scope for our imagination. We could wonder what was going on on the other side of the globe. To-day, if we care to know, we telegraph. The world shrinks in and grows smaller day by day. Wonder is now confined to children and the ignorant. Picture to yourselves how different were the effects of the discoveries of the Elizabethan age. Every day brought the news of new lands, new peoples, new seas. The world grew bigger and called for men of knowledge and of discipline to subdue and to enjoy it. With this outlook, surrounded by these conditions, have we any message to deliver, any advice to give which justifies us in calling upon the public to listen? It appears to me that we have.

To begin with, let us clear our position. Let us sum up what our Society is, and what are the conditions which surround it.

According to the title of our Society, it professes to be interested in the study of literature—the great record of everything which has interested men. In addition, we study Nature in all its forms. And here you must pardon me if I point out one of our peculiarities, which is a trifle old-fashioned, but which the venerable age of our Society must excuse. We seldom hear the study of science advocated at the present day without reference to the material advantages which its students may expect. The promise is held out that their studies will make them richer, or at least will make their competitors poorer. We hold out no such inducements. We study literature and science for the love of them,

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and we profess to seek knowledge for its own sake, and we believe that it is only to those who thus worship knowledge and art that they will unfold their choicest gifts. As to the conditions under which our Society lives, they may be pretty well inferred from the fact that its members are, for the most part, the inhabitants of a provincial manufacturing town. Though the sphere of our Society includes the whole range of human knowledge, still there will always be nooks and corners in this great field which must have for us a special attraction. We have always considered it our special duty to examine and record the scientific phenomena characteristic of our neighbourhood. I am happy to believe that our members are still actively employed in this work. During the past year, the researches in the Lower Lias at Barrow-on-Soar of Mr. Montague Browne, the Curator of the Museum, have been rewarded by the discovery of the skeleton of a small elongated fish, not only of a new species, but of a new genus. It belongs to a highly interesting class of fishes with a persistent notocord, and is an important addition to our list of Liassic fossils.

I have, as well, very great pleasure in announcing that an officer connected with the Government Geological Survey—Mr. Fox-Strangways—has taken up his residence amongst us, and will devote himself to working out the relations of the superficial deposits of the County. He brings to the work a large experience and knowledge of similar deposits, gained in other parts of the kingdom, and we give him a hearty scientific welcome.

In a branch of general science I am very pleased to record the excellent work of Mr. Arthur Rust, in the intensely interesting department of thermo-electricity. Any glimpse of his studies which his time will allow him to give us, I can assure him we shall always highly appreciate.

Among the many subjects of local interest which have from time to time been brought before the Society, the history of the Borough has not, I think, attracted the attention it deserves. The suggestion recently made, that the time has now arrived when Leicester should be added to the list of the cities of our land, has led my friend Mr. William Jackson to favour the town with an admirable paper on the subject. Let us briefly set out some of the undisputed facts of our early Municipal history. We can trace back, on evidence which has never been disputed, the continuous existence of our local legislative and judical body for 850 to 900 years. In its earliest form it possessed two marked peculiarities. It consisted of twenty-four members, and two joint presidents controlled its procedure. Two hundred years before the time of which we are speaking, Leicester had been one of the Five Danish Boroughs. The Danes had invaded England from the east, and the course of their invasion is still marked by a crowd of villages in Lincolnshire bearing Danish names. This group of Danish villages crosses the Cottesmore Hills, decends the valley of the Wreak, and gradually thinning out as it

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penetrates our County, ceases when it reaches the neighbourhood of Leicester. Just south of Leicester, as you are well aware, ran the Roman Watling Street, which by the Peace of Wedmore was the boundary between the Danish Kingdom of Mercia and the English Wessex, governed by the great Alfred. You will see that Leicester was thus the extreme Danish outpost. It was, in fact, the point of the Danish spear which had been thrust into the middle of England. The town was doubtless inhabited by a mixed Danish and English population, standing in such a relation to each other as would make it difficult to maintain the peace between them. Now the normal number of the law-men or jurors, as they were called, the members of the governing bodies, in these Danish Boroughs was twelve, and we have no trace of any other body having two presidents. The inconvenience of the arrangement must be obvious. What, then, was the countervailing advantage or necessity which secured its adoption? No authoritative explanation of this peculiarity has come down to us. Is there, then, any harm in hazarding a guess? There is none, I think, so long as we recollect that it is nothing more. May not one set of twelve jurors and one president have been selected from the Danes, and the other set of twelve with its president have been chosen from the English? In other Boroughs, inhabited by different nationalities, we have instances of their occupying different quarters of the town, each of which has its own laws and governing body. It was creditable to the men of Leicester if they invented and worked this peculiar arrangement of the double governing body, that they might overcome the difficulty of language and nationality, and so secure the peace of the Borough. I am quite aware of the objections which surround this suggestion, but I can invent no better explanation of the facts that have come down to us. If this explanation is correct it would carry back the existence of our Borough Court to the time of Alfred the Great, and give it a life of over a thousand years.

Whether you consider there is any probability or not in the suggestion I have thrown out—if you sweep it entirely away—pray recollect that our Borough Council can boast of a certain existence of over 800 years. The Mayor of Leicester has seen the Normans arrive, he has seen them followed by the Plantaginets, by the Tudors and the Stuarts. He has watched them from his chair as they all disappeared. When he received the writ directing him to send two burgesses to the first House of Commons, whose constitution was to a great extent suggested by the Earl of Leicester, and when the Royal Courts of Justice at Westminster first took the form which they retained for five centuries afterwards, he had certainly presided over his Court for as long a time as separates us from the coming of the Spanish Armada, and perhaps for centuries more. Three times his town has suffered a siege. In one of these sieges the greater part of it was burned. The walls were thrown down and not rebuilt for a hundred years, but no sooner had the inhabitants crept back to the ruins which had been their homes than they again set up those free institutions, which the Burgesses of Leicester can

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boast have flourished for so many centuries in their midst, and without which they did not care to live.

The recent appointment of a Suffragan Bishop of Leicester has raised the question whether the time has not arrived for our town to become a City, instead of a Borough. The claim has been put forward that the setting up of a Bishop's stool in the town makes it a city. As a matter of right it would be well to admit at once that we have no case, and that if we are to become Citizens instead of Burgesses it must be by the favour of the Crown, signified by a Royal Proclamation. I have no means of satisfying myself exactly upon the point, but I suspect that several of the modern Suffragan Bishops have settled in places which are not cities, such as Southwell and Bedford.

If we suppose the Royal Proclamation to have been made, and our ancient Borough to have been tranformed into a City, I know nothing which we could do then which we cannot do to-day. To be sure the Mayor would walk in front of the Mayors of Boroughs, and we should be Citizens instead of Burgesses. We should be called by a Latin instead of an English name. It would be a matter connected with precedence only. A change of the same character as happens to a man when he is addressed as Esquire, instead of plain Mister. Looking fairly at the historical position of our Borough, I cannot say that we shall gain much by the exchange. I do not wish to depreciate the guinea's stamp. There is only one point connected with the change which seems to me worth speaking upon decidedly. I know nothing as to what has been done or what may be contemplated, but this change in name is certainly not worth purchasing at any loss of our self-respect or our independence. If the honour comes to our door, let us respectfully take it in, but do not let us run after it, do not let us set any machinery in motion to obtain it. Such honours, when they are too eagerly sought, lose all their grace and charm.

I am very much mistaken if many of you at the present moment are not thinking that this question of City or Borough, looked at in this way, is after all, too small, too insignificant a subject to be worth our attention this evening. I think it is, but cannot we, by turning it round and looking at it from another side, make something different, something more of it?

This title of a city has excited some, possibly only superficial, but still, some public interest among us. I may not carry you all with me, but permit me to express my belief that there is in this public instinct a soul of goodness. It may be that it is a mere vein, only a thread of pure gold in a mountain of rubbish, but I believe that such a trace of goodness may be always detected if we seek for it aright. Putting aside all cant, let us try to see into the heart of this matter. Suppose for a moment that I could bring on to this platform a typical man from one of the courts or alleys at the bottom of the town,—a man who had the instincts of his class. A man who would probably know as little of what the members of the Literary and Philosophical Society think about as they know of

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his thoughts. Suppose he was all at once to become articulate. What would he say? It seems to me he might say something like this: "As to who walks first and who walks second, I don't care a brass farthing. You tell me that in the old time the men that lived in cities made war and they made peace as they pleased; that great speakers argued before them all these questions of peace and war, of government, of politics and of life; that their very games were an education of both body and soul; that the greatest artists, poets, reciters, play writers, players, speakers, talkers, men whom you say it is your delight still to read;—all these found in these citizens a fit audience, and that the one inspired the other. I wish to make war on no man. I know of war only as misery. But apart from that, this city life, the life these men lived together, the life they led when they were outside their own doors, their public, their social, their common life, was worth living. Why can't my life be something like theirs? Years ago, your Presidents spoke out against the bitterness of party strife, and the gross personalties which were common. Cannot you say something as to the want of intelligence, the pettiness, the Philistinism which one meets at every turn to-day? It is this larger, nobler life, this freedom from the mean and common which I want when I say that I'd be glad for Leicester to become a City It is the reality not the name that I care about."

These may not be your views or mine, but suppose some *enfant terrible* to have come upon this platform and cast them before us, what reply should we feel inclined to make to him? Of course, we could say that he was querulous, impracticable, and that there were difficulties,—that, in fact, his requirements were a mass of impossibilities. All that is very easily said, but must we not admit that in the main his ambition —his longing was wholesome and laudable, and that, though we know no royal road by which it might be immediately and easily attained, that we can point out the direction in which those should turn who are willing to work towards such an end? If you wish to be like a city you must have the institutions—the officers of a city. Now in mediæval cities one of these officers was the Bishop, and so we have continued, in a lax way, to connect the two ideas of a Bishop and a city. What we have seen always together we connect in some sort as cause and effect, just as the old man thought Tenterden Church steeple was the cause of the Goodwin Sands. But a fully equipped city had officers with other than religious duties. It had its legislative body, its executive officers, its taxing officers, officers to superintend the markets, the food, the police of the city. Every city has its educational institutions. We have much in Leicester to be proud of. Our primary schools are second to none in the Kingdom, and of the Wyggeston Schools, any city might be proud. I know no town which can shew a genuine educational institution whose work bears such an amazing proportion to its means as the Working Men's College. We have the Cambridge Extension Scheme showing a very considerable vitality. We have, fortunately, an admirable foundation laid, but if we compare the teaching institutions of Leicester with those of any

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of the old mediæval cities, many of which had neither our population no our wealth, you will find a striking deficiency. With them, the educational edifice was everywhere crowned by a magnificent University. Compare Leicester with Geneva of the present day. The population and the wealth are both in favour of Leicester, Geneva has a University with twenty teachers, several of them men of European reputation. Not satisfied with that, the Municipality never fails to engage, every winter, several well-known men, who may be passing though the city, to lecture to the citizens, and the admission is always free. Besides this, they have two or three series of lectures by men eminent in their different studies. Are we never to have anything like this? May we not hope that, some day, we may have five or six men, every one of whom shall have had a brilliant career in one or other of our great Universities, who shall be a teaching body amongst us,—men embued with the enthusiasm for knowledge, and able to infect with this enthusiasm every student brought into contact with them. This is the great office of the living teacher, and it is his capacity to do this which distinguishes him from the crammer, and this enthusiasm which spreads through his personal influence is the immense advantage which his pupils would have over private students. Depend upon it that such a body of men, teaching in our midst both the old and the new literature, the magnificent literature of our own tongue, the sciences and all that Bacon set down under the head of philosophy, —these men would do more to lift up the tone of the life of our town than any other agency that it is possible to invent. Do not think for a moment that their influence would be limited to their class-rooms. You have hundreds of school teachers, every one of whom, if they wished to succeed in their vocation, ought to come under their influence; and they would carry that influence into every quarter of the town. You have untold numbers of students working by themselves, as sheep without a shepherd, and for the most part discouraged because they waste more than half their time. All these, and many more, are a multitude from which the students would be drawn. Submitted to combined discipline and intelligence, and familiarised with the great models of all that was good and noble in all time, they would infallibly rise to a higher level and feeling and of conduct. It is useless for you to listen to the charming of the electioneerer who is always telling his audience they need no discipline—except in electioneering. There can be no sound, no lasting education worth the name without discipline, and I am convinced that the future will belong to those bodies, to those classes and communities who can construct and who will submit to a wise discipline, and it is this want of a higher educational discipline which is the great weakness of large towns.

I know too well the objections which can be brought against my proposal. It is visionary. It is impossible. There are no students in Leicester. They would not go to it if a University was set up. I deny them all. I stand upon a platform from which my predecessors, as Presidents of this Society, have promulgated schemes which, then, were

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thought to be equally visionary and impracticable. Those schemes have, many of them, since been carried out, and to-day they are the ornaments of our town. I am confident that you will agree with me that I am not exceeding the duty of my office when I plead that those studies which to-day are the delight, the solace and the luxury of the few, should finally become the inheritance of all.

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THE NATIVE BULBS OF LEICESTERSHIRE.

By F. T. Mott. (Read before Section "D," April 17, 1889.)

A TRUE Bulb is a very short stem, with the buds close together and the leaves aborted into succulent or membranous scales. If these scales are thick, narrow, and imbricated, as in the Lily, the Bulb is said to be *scaly*; if they are thinner, and wrap round each other in concentric layers, as in the Onion, the Bulb is said to be tunicated.

A Corm is also a shortened stem, surrounded by abortive leaves; but while in the Bulb it is the leaves which are chiefly developed, in the Corm it is the axial part or stem, the leaves being reduced to a few thin membranous coverings.

A Tuber is properly a shortened and thickened stem, in which the leaves are not generally developed at all, the eyes being incipient buds from which leaves may spring; but the epithet *Tuber* is applied loosely to swollen roots as well as to stems or rhizomes.

All these forms of plant growth are so many varying methods of storing away food-material for carrying on the life of the plant from season to season, this food-material being some form of hydro-carbon, starch in most cases, in others sugar, inuline, lichenine, &c.

The Tuber is a form of food-store which occurs both in Dicotyledons and Monocotyledons, but the Corm and the Bulb are confined to Monocotyledons, and the Bulb occurs only in the Orders Amaryllideæ, Irideæ, and Liliaceæ. These three Orders include about 4000 species, of which about 3000 are Bulbs. Of these only 26 are reckoned as British, and represent only the Orders Amaryllideæ and Liliaceæ, while the Leicestershire Flora includes but 10 species—two Amaryllids and eight Liliads, and of these only one Amaryllid and three Liliads can be regarded as real natives. We have also one native Corm, the Meadow Saffron (*Colchicum autumnale*), which is recorded for several localities in the County; but not being a true Bulb, it is only incidentally mentioned here.

These bulbous plants are distributed in nearly all parts of the world, but chiefly in the temperate and sub-tropical zones. A large number of Amaryllids and of the Asphodel tribe of Liliads are natives of the Cape of Good Hope. At least 200 species are indigenous in various parts of Europe, and it is a little remarkable that so few have made their way into these islands. They are all herbaceous plants, the object of the bulbs being to protect and nourish the bud in which the vitality of the plant is concentrated during winter; and they nearly all bear showy flowers very much given to variation, and therefore very amenable to the arts of the cultivator.

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The four which claim to be real natives of this County are the Daffodil, the wild Hyacinth, and two species of Garlic. The Snowdrop, Martagon Lily, Fritillary, Tulip, and two species of Star of Bethlehem are the other six which occasionally occur in the County, but are almost certainly escapes from gardens.

The wild Hyacinth and the Bear's Garlic or Ramsons (*Allium ursinum*) are the only two bulbous plants which can in any sense be called "common" in Leicestershire. But the wild Hyacinth, the Bluebell of the Spring, is a host in itself. Common in nearly every County of Great Britain, it cannot be more abundant anywhere than in the woods and copses of Leicestershire. In the month of May the beautiful azure of these flowers spreads through all our woodland districts as if some invisible painter had laid a wash of blue over the landscape. I remember, many years ago, having climbed with a friend the western side of Bardon Hill on a warm Spring day, and being terribly thirsty, with no chance of water on those lofty crags, suddenly catching sight of a broad pool far down towards the part of the hill on the eastern side. It was a quarter of a mile away, but, with the eagerness of deadly thirst, we sprang down the rocky slope, through the fern and brushwood, and under the young green foliage of the oaks till we had nearly reached the margin of the pool, when we pulled up abruptly and looked at each other in speechless disappointment, for the tempting pool was only a mirage of Bluebells!

I have been surprised to find that in Parkinson's great "Herbal" ("Theatrum Botanicum"), printed in 1640, this common and favourite flower is not once mentioned. Turning to his earlier work, the "Paradisus, or Garden of Pleasant Flowers," printed in 1629, I find a description of it under the name of "English Hares-bels or Spanish Iacinth" (*Hyacinthus Anglicus Belgicus, vel Hispanicus*). He speaks of it as "so common everywhere that it scarce needeth any description," and says that the flowers are either deep blue, pale blue, or bleake blue, tending towards ash colour, and sometimes white, blue and white, or pink. He gives also a very good life-size figure of it.

In this County it is easy to know when the Bluebells are in flower without going far from the town, for every suburban road bears withered relics of the nosegays gathered by innumerable children and carelessly dropped on their way home. These plants grow freely in gardens, but to get the roots a trowel is necessary, for the bulbs lie deep in the light leaf-mould of the woods.

There has been much dispute as to the right which the blue Hyacinth has to the name of Harebell. Parkinson's authority is in its favour. The rival plant, *Campanula rotundifolia*, is not mentioned among the Bellflowers in the "Paradisus," but in the "Herbal" it is called the Wild Field Bellflower, without allusion to any other English name. If the word is spelt "Harebell," it should always refer to the Hyacinth, both by right of priority and also of appropriateness, its haunts being just those semi-shady places where plants grow tall and rank, in which the timid hare delights to make her form. But if it be spelt Hairbell,

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then without doubt it must refer to the Campanula, whose flowers dance in the breeze upon their slender hair-like stalks, but whose favourite habitations are dry heaths and sunny banks, where the grass is short and hares will seldom come.

The Bear's Garlic, *Allium ursinum*, is mentioned in both of Parkinson's works by this Latin name, with the English title of Ramsons or Wild Garlic. It is not nearly so common in Leicestershire as the Hyacinth, yet it is pretty widely distributed in damp and shady places, and is recorded for most of the larger woods on Charnwood Forest. The name "Ramsons" is from the Scandinavian root *rams*, meaning *rank*. Anyone who has walked through a bed of this Garlic will understand the allusion. Notwithstanding its odour, the plant is wholesome, and not so strongly flavoured as the cultivated Garlic. The leaves are sometimes mistaken for those of the Lily of the Valley, and the flowers have the same brilliant whiteness, though not the same fragrance or the same grace of form.

Our other wild Garlic (*Allium vineale*), the Crow Garlic—"Crow" being supposed to indicate its worthlessness for man's use—has been recorded in three of our 12 botanical districts, chiefly about Charnwood Forest, but is rare, and apparently dying out. I have only seen one recent specimen, which was gathered by G. Robson at Groby. The Crow Garlic, in common with several other species of Allium, has the curious habit of producing bulbils among its ordinary flowers. These appear to be aborted flower-buds. A bulbil or small bulb must be regarded as a shortened branch, and a branch is the elongation of a leaf-bud. These bulbils, therefore, are leaf-buds taking the place of flower-buds. Dr. Masters, in his "Teratology," points out that the production of leaf-buds in place of flowers is generally due to excess of nutrition, which curiously corresponds with the recorded habitats of the three varieties of *Allium vineale*. Syme describes these varieties as (*a*) flower-heads without any bulbils, growing only in dry sand; (*b*) having bulbils mixed with the flowers, growing on sandy shores, presumably less arid than the "dry sand," and affording better nutrition; (*c*) with the heads composed entirely of bulbils, growing in "pastures and waste places," which would be conditions of luxury in comparison with a bare sandhill.

The last of our four native Bulbs, the yellow Daffodil, is even rarer than the Crow Garlic, only one locality being recorded for it in the whole County. This is on a grassy slope of the Harby Hills near Belvoir. Daffodils are found apparently wild in many other places, as at Wistow, Bradgate, Ulverscroft, &c.; but it is pretty clear that these are all escapes or relics of old gardens, and are varieties of the cultivated species, which differs from the truly wild one, in having the leaves more glaucous and the outer perianth segments yellower. The name Daffodil is said by Mrs. Lankester to be a corruption of two old English words, "*affo dyle*," meaning "that which cometh up early." Parkinson, in the "Paradisus," says the English Daffodil is so common in copses, woods and orchards, that he need scarcely describe it. Syme speaks of it as common in the

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South of England; but if the truly indigenous form was ever common in Leicestershire, it is so no longer.

Our six naturalized Bulbs, the Snowdrop, Martagon Lily, Fritillary, Tulip, Common Star of Bethlehem, and Drooping Star of Bethlehem, are only found where there have been old gardens, as at Bradgate and Ulverscroft, or where they have been planted, as ornaments originally, in woods and copses, and have propagated themselves perhaps for centuries.

The Fritillary and Tulip are the only two which are considered as indigenous in Britain. The others are European forms, introduced into English gardens no doubt in very early times, Bulbs being particularly suitable for the simplest kind of gardening, as they mostly bear showy flowers, are easily transported, and give no trouble when once planted.

Can any reason be assigned why bulbous plants should generally bear showy flowers? Herbaceous plants are very numerous, both among Monocotyledons and Dicotyledons, and in each section, while there are many species which bear flowers of supreme beauty both in form and colour, there are others with inconspicuous flowers, as the Grasses, Sedges, and Rushes among Monocotyledons, the Docks, Spurges, and Nettles among Dicotyledons. The herbaceous habit, although it is largely associated with conspicuous flowers, is not by itself a sufficient explanation of them.

If we regard the production of a coloured perianth as the final effort of vegetable life, demanding the utmost exertion of concentrated energy to bring it about, those species which are able to produce it must represent the climacteric in the life-cycle of the genus or Order to which they belong, while those species which are not able to produce coloured perianths will represent earlier and less elaborated forms of the same types. The herbaceous flowering plant appears to be, geologically, a production of quite recent date, and, as I have elsewhere suggested, may be due to the depressing influence of the Glacial epoch upon forms which were just developing their stem and branch system, but in which this development was checked by the decreasing temperature and kept back for so long a period that the energy which could not find its normal outlet in that direction merged at last into that which was destined to produce flowers, and so accelerated and intensified the flowering tendency.

Where the stem and branch system was not so entirely suppressed but that some part of its proper energy was used in the producing of a short thick succulent underground stem—a Bulb, Corm, or Tuber—this seems to have been a successful method of assisting the flowering tendency, and thus these bulbous plants came to produce perianths particularly large and brilliant in proportion to the size of the plants themselves.

The influence of insect fertilization and selection has probably still further assisted in the development of these coloured perianths, but I cannot myself regard this as more than a collateral aid in a process which would have run its course equally well, though not with equal rapidity, if no insects had existed.

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SHAKSPERE'S JESTERS.

By WILLIAM SIMPSON. (Read before Section "A.")

THE jester was a prominent figure in the Royal Courts of olden times, and served a useful purpose. Courtiers are apt to overlook the failings and foibles of a monarch, but it was the jester's duty to remind him of these. For their plain speaking, indeed, jesters were occasionally punished, but they usually enjoyed a wide licence. It is a matter for regret that their wholesome influence no longer prevails at modern Courts. Sovereigns might with advantage be warned by jesters, as the Lady Olivia was warned by her fool, against excessive mourning for a relative's death and neglect of public duties. The gentleman now dignified by the title of "the Queen's Jester" is not a resident at Court—his range is limited to circuses.

In former times the nobility and gentry had fools and clowns corresponding to jesters at Court. If the luxury of a special jester could not be afforded, a general servant of waggish propensity would be engaged as a kind of "clown of all work."

In considering, then, Shakspere's jesters, we shall include all "clowns" and "fools," or professed jokers. But there are several "clowns" in Shakspere's plays who are not within the scope of our inquiry. The word "clown" is, of course, used in two quite different senses. In its original etymological sense it signifies a rustic or ignorant countryman: in its derived sense it means a jester—such as a circus clown. The distinction between the two is illustrated in "As You Like It." There Touchstone, the clown or jester, on meeting William, a simple country clod, remarks:—

"It is meat and drink to me to see a clown."

The two grave-diggers in "Hamlet" are called "clowns," but the humour of their conversation lies in their stupidity rather than in their wit. They savour of Dogberry, not of Touchstone, and hence concern not our present purpose. The characters who figure in the list of *dramatis personæ* as "Clowns" in "Othello," "Anthony and Cleopatra," and the "Winter's Tale," for the same reason are not within the category of jesters. The "fool" in "Timon of Athens," too, may be omitted, as he appears only once throughout the play, and that in a scene classed as non-Shaksperian by the best critics.

Having gone through this sifting process, we find that out of the thirty-seven plays usually credited to Shakspere, there are only ten in which jesters appear. Taking these plays in their chronological order,

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and dividing them into three groups of early, middle, and late period, we have in the early period Costard in "Love's Labour Lost," the two Dromios in the "Comedy of Errors," Launce and Speed in the "Two Gentlemen of Verona," Launcelot Gobbo in the "Merchant of Venice," Grumio, the comic servant, in the "Taming of the Shrew," and the clown in "All's Well that Ends Well." In the second or middle period —that of his bright and charming comedies—we find Touchstone in "As You Like It" and Feste in "Twelfth Night"; whilst among plays of the latest period we have the fool in "King Lear" and Trinculo, a jester, in "The Tempest."

Now it must not be supposed that Shakspere was the first to introduce jesters upon the stage. He found in the plays of his predecessors abundance of fools and comic characters, but, as Gervinus points out—

"In the first English tragedies the most extravagant jests were intermingled in no wise in connexion with the main action, but merely serving the purpose of exciting laughter. The fool was allowed to conclude the play with absurd jigs, to fill up the time between the acts with jests, and to introduce into his part all extravagances of improvisation. Shakspere unrelentingly banished from the stage the extreme buffoonery of the fools and their unreasonable freedom. When he mingled the king and the fool, jest and earnestness, tragic and comic parts, he did so on the condition that the matter itself demanded it. He accommodated himself to the popular taste only in the conviction that even to this peculiarity of the rude stage he could give a more refined turn. He developed the character of the fool in the cleverest manner in comedy, but he knew how to use it also for the most tragic effects. He sketched the most grotesque scenes, but he knew how to link with them the most sublime matter."

Speaking generally of the jesters in the early period plays, we must admit that their wit and humour are not of a high class, nor are they intended to be so. A gradual improvement can be traced. At first they are little better than punsters. They might truly say what a genuine jester Feste, the Lady Olivia's fool, too modestly says of himself:—

"I am indeed not her fool, but her corrupter of words."

Their jokes are often so well worn and time-honoured as to be within the comprehension of the dullest of their audience. There are several good soliloquies of clowns, such as that of Launce leading in his dog in the "Two Gentlemen of Verona" (Act II., Scene III.); of Grumio in the "Taming of the Shrew" (Act IV., Scene I.); and of Launcelot Gobbo in the "Merchant of Venice" (Act II., Scene II.). But though the wit of these early jesters is not brilliant, their presence in the plays is more than justified. Besides enlivening the scene, they aid in the development of the plot, being useful and often indispenable as characters in the plays.

In the middle period of Shakspere, we find the finest jesters in comedy. Touchstone, the king of jesters, by his active wit and cheery merriment, sustains his comrades in adversity. He serves, too, as an admirable contrast to the melancholy and misanthropical Jaques. It has been well said that "Jaques's wisdom is half foolery, and Touchstone's foolery is half wisdom." Philosophy and folly are, indeed, strangely

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mingled in both. In a choice between the two, we should probably incline to Rosalind's view:—

"I had rather have a fool to make me merry than experience to make me sad."

The so-called fool displays more common sense and real wisdom than the philosopher on this occasion. We cannot compliment him in better words than those of the banished Duke:—

"He uses his folly like a stalking horse, and under the presentation of that he shoots his wit."

Perhaps the most admirable passage that can be selected as an illustration of Touchstone's dialogue is his conversation with the shepherd Corin, in Act III., Scene II., on the comparative merits of town and country life.

Feste, in "Twelfth Night," if not so brilliant as Touchstone, is more tender and charming. The former excels in wit, the latter inclines towards humour. Feste's rendering of the lyrics "O, Mistress mine, where are you Roaming?" and "Come away, Come away, Death," will suffice to immortalize him. He is equally at home singing pensive love songs to the love-sick Duke, joining in jovial catches with that lusty reveller, Sir Toby Belch, and his limp companion, Sir Andrew Aguecheek, or aiding in Maria's plot against Malvolio by assuming the part of Sir Topas the Curate on a visit to the Steward in prison. His bantering dialogue with the Duke in the fifth Act offers a fair sample of his dainty wit.

We now reach the last period of Shakspere's jesters. The only tragedy in which a fool appears is that of "King Lear," the most powerful and pathetic of all tragedies. Here there is not, as in "Hamlet" or "Macbeth," any supernatural element introduced to heighten the tragic effect: we see plain human nature in its most terrible and awful depths. Is it not a tribute to the supreme genius of Shakspere that in this tremendous tragedy he should have dared to introduce a "fool," and that the fool should positively enhance the impression of intense pathos? This play seems to me too great for adequate representation on the stage or for recitation. The subject and the treatment are too overpoweringly real to be simulated. To a king steeped in such an abyss of agony, no ordinary man could presume to offer sympathy or even words. Fitly, then, is the fool given as his companion. The bitterest sarcasms and jests from the fool are more tolerable than the condolence of the wise. "Dost thou call me fool, boy?" cries the heart-broken king. "All thy other titles," replies the fool, "thou hast given away; that thou wast born with." It is scarcely necessary to point out that a vein of tenderness and melancholy runs through the keenest utterances of the fool, which makes him the most pathetic of all jesters.

The last step we take must be from the sublime to the ridiculous, from the fool in "King Lear" to Trinculo in "The Tempest." This associate of drunkards must plead "drink" as the excuse for the feebleness of his jests. We meet him, unfortunately, when misery has acquainted him with strange bedfellows and associated him with unworthy comrades, Caliban and Stephano. Let us hope that in the

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Neapolitan Court he shines with greater brilliancy than his surroundings in "The Tempest" permit. So disappointing is this last of Shakspere's jesters that he and his vile companions must be driven forth ere we can enjoy with Prospero, the great magician, and his friends, the calm repose which marks the conclusion of "The Tempest."

In this sketch of Shakspere's jesters, we must bear in mind that the jesters really absorb only a small portion of the poet's wit and humour, which are bountifully scattered through his plays, adorning a Rosalind, a Mercutio, a Falstaff, and a host of other characters lying outside our limited territory. We have, indeed, been following only one small stream of the many which flow from a well-nigh inexhaustible source.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

There have been three Meetings during the last quarter, at which the average attendance was nine.

Papers read:—

October 15th.—The CHAIRMAN, "Characteristics of Savage Life."

November 19th.—Mr. WM. SIMPSON, "Shakspere's Jesters."

December 17th.—Mr. T. H. FOSBROOKE, "Ashby Castle."

T. CARTER, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

September 18th.—The CHAIRMAN reported that at the monthly Field Meeting, on the 11th. ten members of the Section visited St. John's Stone, near the Abbey, and the Castle Hill, near Beaumont Leys, and spent the evening at the CHAIRMAN'S house, at Birstal Hill.

At St. John's Stone, the terraced appearance of the steep grassy bank surrounding the hollow was noticed. The CHAIRMAN remarked that such terracing of steep banks was a rather frequent phenomenon, and had given rise to a good deal of discussion as to its cause, no explanation that was quite satisfactory having yet been found. In the course of the afternoon, the Rev. T. A. PRESTON collected 70 species of wild plants in flower.

Exhibits.—Live frogs, by the CHAIRMAN and the SECRETARY. A discussion ensued respecting changes of colour in these animals. Mr. STORER stated that he once caught a very yellow frog and put him in a box on some very black soil. By the next morning the frog had changed to a dark colour.

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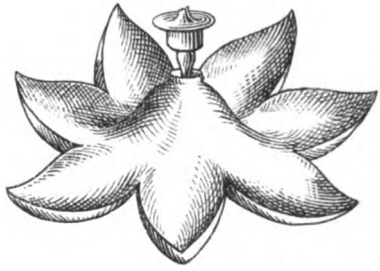

Geaster Bryantii (nat. size).

A rare Fungus, growing under Yew trees in the Garden of the late W. STRETTON, Esq, the Fosse, Leicester, October, 1889.

Cornus capitata.

Ripe Fruit (red), nat. size. From the open air in Cornwall.

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A number of seeds and fruits from Mrs. MACAULAY'S garden at Kibworth, by Dr. FINCH, including those of the Japanese Winged Pea, Bladder Senna, Leycesteria, Fraxinella, Horned Poppy, &c.

Several interesting plants, by Miss HOTTINGER, including *Actæa spicata*, from Yorkshire; *Polygonum vaccinifolium*, from hedges in Cornwall, where it has been planted; *Taxodium distichum*, &c.

A fine collection of British Birds' Eggs, by Mr. J. PALMER, including a cuckoo's egg taken from a Robin's nest, but not at all resembling a Robin's egg.

A Tailed Wasp, *Sirex gigas*, from Skeffington, by the CHAIRMAN. Mr. STORER remarked that this insect was mostly imported in foreign timber, but that when hatched in this country some individuals became partially naturalised, and would breed here. In these cases, however, the progeny were generally smaller than the imported specimens.

A specimen of the remarkable fungus, *Geaster Bryantii*, from the late Mr. W. STRETTON'S garden, on the Fosse, sent by Mr. W. A. VICE.

Paper on "The Leicestershire Cruciferæ," by the CHAIRMAN. An account of the characters and geographical distribution of cruciferous plants in general, followed by remarks upon the 37 species recorded in the Leicestershire Flora, and more particularly upon the 22 species believed to be true natives of the county, of which 16 belonged to the long-podded section and 6 to the short-podded.

October 16th.—Exhibits.—Several interesting garden plants, by Miss HOTTINGER, especially a flowering spray of *Desfontainea spinosa*, from Cornwall.

This remarkable shrub, bearing a handsome red flower, and belonging to the order *Gentianeæ*, has leaves scarcely distinguishable from the common Holly.

Geaster Bryantii, from the Fosse, by Dr. TOMKINS. This rare fungus is very striking in appearance. The garden in the Fosse is its only known locality in Leicestershire.

Specimen of *Orobanche Hederæ*, from Conway Castle, by Mr. W. A. VICE. This plant was brought from Conway when very young, growing on a root of ivy. The ivy was planted by Mr. VICE and grew, and the Orobanche grew also, and flowered, but the spike was much smaller than usual.

Bark and fibre of a Birch tree struck by lightning near Groby, by Rev. T. A. PRESTON. Also proliferous flower-heads of *Helenium*, and a collection of autumnal leaves.

Collection of autumnal leaves, by the CHAIRMAN, who made some remarks upon autumnal colouring, and suggested that it was due rather to the maturity than to the death of the leaves, the true death being coincident with the actual fall, after which the colours fade.

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Paper on "A Comparison between the Linnæan and Natural Systems of Botanical Classification," by the Rev. T. A. PRESTON. The object of the Paper was mainly to show that, for naming a plant, the Linnæan system was the simpler and quicker, that to get the name was the most necessary first step to getting further information, and that, in working out the name by the Linnæan system, as much was learnt about the character of the plant as by the Natural system. The Linnæan was certainly not so scientific an arrangement as the Natural, and yet nearly one-third of the Natural orders of British plants coincided almost exactly with Linnæan classes.

The CHAIRMAN pointed out that the system now called "Natural" was invented before the laws of evolution had been studied, and that, in the classifications of the future, the *pedigree* of genera and families would have to be taken into account.

November 20th.—Exhibits.—A beautiful specimen of the ripe fruit of *Cornus capitata* (syn.: *Benthamia fragifera*), by Miss HOTTINGER.

This interesting shrub is a native of Nepal, but flourishes in the open air in Cornwall, and the fruit exhibited was grown and ripened there. It is a fine red edible fruit, nearly two inches in diameter.

Fungi, by Mr. W. A. VICE, including some specimens of *Agaricus (Mycæna) galericulatus* of a very unusual size, being about six inches high, with the pileus two inches across. One of them had a smaller resupinate pileus growing on the upper surface of the normal one.

Paper on "The Preservation of Birds' skins for Museums and Cabinets," by Mr. G. H. STORER. The Paper described the processes of skinning, preserving, stuffing and mounting, pointing out some improved methods adopted by the author in his own practice, as an amateur. It was illustrated by an excellent series of cabinet skins and a glass case containing an American Bittern, set up by Mr. STORER in the modern style. Among the skins were several sets showing the changes of plumage from the nestling to maturity, and from summer to winter, and an example of the very rare Sickle-billed Creeper, from Guiana.

F. T. MOTT, *Chairman.*

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SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

October 8th.—A joint meeting of the Members of Section "E" and those of the late Geological Section "C" was summoned to consider the question of amalgamation.

The CHAIRMAN (Dr. F. M. POPE), in opening the discussion, expressed his regret that the Geological Section had been unable to continue its existence on a separate basis. He advocated its re-constitution, if such a course should be found practicable, but spoke of the pleasure with which he should welcome such of the late Members as might feel disposed to join the ranks of Section "E." He alluded also to the increased vigour which pervaded the work of the latter Section, intimating that the proposed accession to the ranks should not be looked upon in the light of an avowal of weakness and appeal for increased strength on its part, but rather in that of the wish to avert the threatened dispersion of earnest workers in the field of Geological inquiry by the dissolution of Section "C."

Mr. L. HODGES—whose remarks were confirmed by Mr. J. D. PAUL—bore testimony to the futility of the efforts which had been made to keep on the Geological Section, mentioning that their chief difficulty arose from the scanty supply of Papers, and from the general lack of interest shown, except amongst a very narrow circle.

Mr. MONTAGU BROWNE insisted on the impossibility of disassociating Zoology and Palæontology, and the unmixed advantages to be derived from amalgamating.

Mr. W. A. VICE also spoke in favour of the scheme, and suggested the advisability of holding special meetings, as circumstances might arise, for the consideration of matters purely Geological.

After some further discussion on points of minor importance, the following resolution was put to the meeting by the CHAIRMAN:—

> "As Section 'C' no longer exists, its former Members are invited to join Section 'E'; and in future Papers relating to Geology and Palæontology will be read in the latter Section."

Carried unanimously.

Before the dispersion of the meeting, Mr. MONTAGU BROWNE exhibited a very fine fossil Neuropterous insect, recently discovered by him at Barrow-on-Soar, and which, provided it were unique, he had provisionally named *Ellisneura maculata*—nov. gen. et sp.

October 14th.—The CHAIRMAN delivered a most forcible and instructive Address upon the "Fore-limb of Vertebrates."

His remarks were arranged with a view to illustrate the gradual development and specialization of the fore-limb, from the arrangement

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found in Elasmobranch fishes to that present in the higher Mammalia. Taking the various Classes and Orders seriatim, the different grades of development in each—together with any modifications or peculiarities of special importance—were lucidly explained.

The value of the address was considerably enhanced by the free use of both specimens and diagrams. Several of the former possessed features of more than ordinary interest, notably the pectoral arch of a Ray, prepared by a new process which arrests the shrinkage of the cartilaginous elements, preserving them in a natural and elastic condition. This was prepared and lent by Mr. MONTAGU BROWNE, who also lent the other specimens shown, all being taken from the Museum collections.

At the conclusion of the address, Mr. BROWNE proposed a vote of thanks to the CHAIRMAN for his admirable discourse, which was seconded by Mr. W. A. VICE, and carried unanimously.

November 11th.—Mr. C. J. BOND, F.R.C.S., read a Paper on the "Changes in an Egg during Incubation."

After remarking that the subject-matter of his address lay, if not in a nut-shell, yet in an egg-shell, he alluded to the general lack of information on such topics as the one with which he was about to deal, expressing an opinion that the necessity of teaching children, in an elementary manner, the steps by which an egg grows into a chicken, is of equal importance to demonstrating to them how a seed turns into a plant or how changes in inorganic materials are brought about by machinery or mechanical means.

Mr. BOND then proceeded to describe the structure of an egg with its shell, white and yellow yelk, and blastodermic area. The differentiation of the latter into the two layers of epi- and hypoblast, and at a later period the mesoblast, was briefly sketched, together with the formation of the notochord and neural canal. The change of the mesoblast into somatopleure and splanchnopleure was next noticed, with the first appearance of the alimentary canal and the organs connected therewith. At this point attention was called to the arrests of development found occurring not uncommonly in many animals, and a description was given of the way in which complete closure of the oral aperture may take place in those cases in which it is found to be absent at birth.

After alluding to the appearance and respiratory function of the Amnion, the development of the vascular system was clearly explained, together with the causes governing the various positions of the Aortic arch in different Vertebrates.

In treating of the sense organs, the various stages in the development of the olfactory, optic, and auditory organs were traced in succession, and it was shown how the epiblast is chiefly concerned in their formation. Remarking on this circumstance, Mr. BOND observed that it would appear as if that peculiar receptivity, or aptitude to receive and transmit delicate

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outside impressions, so essential in a sense organ, resides chiefly in that outer layer of embryonic cells, which, in the gradual evolution of the vertebrate embryo in past ages, had throughout been the first to receive impressions from the outer world.

In concluding an address in which the salient details of a difficult subject were presented in a manner at once lucid and interesting, stress was laid upon the great value of the science of embryology in showing, as it does, how the phylogenitic or race-development of animals finds its counterpart in the ontogenitic development of the individual, and several examples were brought forward in illustration of this.

Mr. BOND was warmly applauded at the termination of his Paper, and on the proposition of the CHAIRMAN, seconded by Mr. W. A. EVANS, a very hearty vote of thanks was accorded to him for his masterly exposition.

The Paper was illustrated by a large number of diagrams prepared by the SECRETARY, and also by a magnificent series of sections of Chick embryos exhibited by the LECTURER. Seven or eight Microscopes were lent by Messrs. BOND, POPE, QUILTER, PALMER, and WARD. Selected Slides, showing the formation and completion of the neural canal, the development of the limbs, liver, eye, &c., were placed under these, and the Members present enjoyed a rich treat in examining mounts in which every detail was brought out in a most admirable manner.

Other Exhibits were:—Specimens of *Helix hispida*, var. *elevata*, Williams, from Evington, new to Britain, and described in the "Midland Naturalist" for August, 1889, p. 193; also *Carychium minimum* and *Achatina acicula*, both new records for the County, by Mr. A. E. BAKER.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1889.
Jan. 15.—Professor W. H. FLOWER, C.B., LL.D., F.R.S., &c. (President of the British Association). "Pigmies."

,, 27.—F. M. POPE, Esq., M.B. "Dreams."

Feb. 10.—THOMAS MATESDORF, Esq. "Raffaelle's Masterpiece." (Illustrated by Limelight Transparencies).

,, 24.—CHARLES J. BILLSON, Esq., M.A. "The English Novel."

Mar. 10.—FRANK E. BEDDARD, Esq., M.A. (Prosector to the Zoological Society of London, and Davis Lecturer). "The Colours of Animals."

, 24.—G. R. KIRWAN, Esq., M.A. "Early Elizabethan Dramatists."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. THOMAS CARTER, Mill Hill House.

Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

1889.
Jan. 21.—Mr. ROBERT HARVEY, LL.B. "The Elements of Pictorial Effect."

Feb. 18.—Miss E. A. HAYES. "Criticism Criticised."

Mar. 18.—Mr. G. P. HARPER, M.A. "Henry Thomas Buckle."

The Meetings are held the third Tuesday in the month, at seven o'clock, in the Council Room at the Museum.

THOMAS CARTER, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum

1890.
Jan. 15.—1. Exhibition of Marine Shells and Corals.

2. Paper on "The Development of Museums as Public Educators," by the CHAIRMAN.

Feb. 19.—1. Exhibition of Sea Weeds.

2. Paper on "The Teaching of Botany," by Miss HOTTINGER.

Mar. 19.—1. Exhibition of Spring Flowers and Insects.

2. Paper on "Microscopic Fungi," by Mr. W. A. VICE.

F. T. MOTT, *Chairman.*

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SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1890.

Jan. 20.—Paper, communicated by the Rev. A. L. SPARKES, M.A. (Corresponding Member).—"A Naturalist's Life in S. America."

Feb. 17.—Paper by Mr. W. P. PYCRAFT—"Pterylosis of the Wing in the Wild Duck (*Anas boscas (L.)*." (Illustrated).

Mar. 17.—Paper by Mr. G. H. STORER—"On the American Beaver (*Castor canadensis*), including notes made by a correspondent whilst resident in the Nipigon district." (Illustrated.)

The Paper for the evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

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SOCIETY.

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E. ZOOLOGY, (With which is amalgamated Section **C.** GEOLOGY).

Chairman, F. M. POPE, M.B.

Secretary, F. R. ROWLEY,
Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1889-90.

JANUARY TO APRIL, 1890.

GENERAL MEETINGS.

January 13th, 1890.—Professor W. H. FLOWER, C.B., LL.D., F.R.S., &c. (President of the British Association), on "Pigmies." (Professional).

Professor FLOWER, at the outset of his remarks, said there was a widespread belief among the ancients of the existence, in some remote part of the world, of races of men of very diminutive size, who received from the Greeks the name of Pigmies. The first mention of Pigmies was to be found at the beginning of the third book of Homer, which described that curious myth so often recounted in Greek poetry—a battle between the Pigmies and the Cranes. These stories mostly associated with Pigmies characteristics of the negro races. Aristotle and other writers of the same period alluded to the existence of Pigmies in Africa and India, and a very circumstantial account of the discovery of a small race of people inhabiting a remote region of Central Africa was given by Herodotus more than 2,000 years ago. When the knowledge of the geography and the inhabitants of the world, human and animal, became more generally known, soon after the middle ages, all these stories of Pigmies were again revived, and endeavours were made to account for them. Many writers came to the conclusion that the belief in the existence of Pigmies had its foundation in the different races of monkeys in Asia and Africa.

Within the last 30 or 40 years, however, further exploration and further informaton had brought to light the actual existence in certain parts of the world of races of real men—not monkeys—who, if they were not of the small size attributed to the Pigmies of the ancients, were yet so much smaller than the generality of mankind that in all probability the discovery of their ancestors gave rise to many of the stories he had referred to. All the people whom he included in the class described as Pigmies were less than five feet in height. There were several peculiarities which marked these races of little people. They were all found in the old world, and only in the tropical regions; they had all more or less the negro cast of countenance, and they were always distinguished by the characteristic of curly or frizzled hair.

Dealing first with the Asiatic portion of the tropical regions, he observed that the Andaman Islands, in the Bay of Bengal, were, until 1858, inhabited solely by a race of small people, the males of whom did

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not average more than 4-ft. 9-in. in height, and who had the reputation of being exceedingly ferocious and inhospitable. About 30 years ago, however, the Andaman Islands were formed into penal settlements, the result being that the natives were rapidly dying out. Many of their habits and customs bore traces of great antiquity. They had no agricultural pursuits, but subsisted on the fruits of the chase, being very expert in the use of bows and arrows. Some of their customs were remarkably strange, among others being the habit of wearing as an ornament the painted skulls of deceased relatives. In the interior of several of the Philippine Islands a race of diminutive people had been discovered bearing a remarkable resemblance to the Andaman Islanders. Further investigations of recent travellers in this part of the world showed that in the interior of many of the islands inhabited chiefly by Malays, there were people of small size, quite different in their habits and general characteristics from the present prevailing population of those places. The conditions under which they lived—in fastnesses of the mountains, subsisting entirely by hunting and fishing—had led some eminent geographers to believe that all that part of the world was once inhabited by small black races of curly-haired people, who were, in fact, the primitive owners of the land. It was surmised that the Mongolian and other races had gradually invaded their territory, and in most instances entirely dispossessed the original inhabitants of the land. In Africa there were several distinct races of Pigmies known to exist. In the South there were still to be found a few Bushmen living in the mountain fastnesses, but they too were fast becoming exterminated. On the East coast De Chaillu and other travellers at different periods found tribes of very small people living quite isolated from the larger negroes, their average height being about four feet nine.

Some interesting information had been contributed by Emin Pasha concerning a race called the Akkas, who were kept as slaves by more powerful chiefs in Central Africa. Two skeletons of Akkas were forwarded by Emin to the British Museum, neither of them standing more than four feet high.

Stanley, in his recent remarkable letters, constantly made mention of his encounters with tribes of dwarfish people who attacked the expedition at every possible opportunity. From his accounts, and from the records of many other travellers who had explored the Congo, all the region in the great bend of the Congo appeared to be inhabited principally by these pigmy people. Similar tribes, too, were scattered across equatorial Africa, the size generally ranging from four to five feet. They were always at enmity with the surrounding tribes, who were far in advance of them in civilization. The great wonder was that they had not all been exterminated long ago, and there was little doubt that they would gradually become extinct.

A number of life-sized illustrations of Pigmies, representing different races, were exhibited during the lecture.

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January 27th.—F. M. Pope, Esq., M.B., on "Dreams."

The Lecturer said that, though his subject had been announced as "Dreams," he was not sure that it should not rather have been termed "A Brain Study," for dreams were a function of the brain, and until they could understand something of what the brain was, and how it worked, they could not appreciate in any way what a dream really was, and, what was more important still, how a dream came to be what it was. The brain consisted of a large mass of cells joined together by their processes, and each of those cells was, either directly or indirectly, connected with a sense organ at the exterior of the body, and was capable of being excited by stimuli derived from outside. The cells had a life of their own as well as other parts of the body, and were not capable of working for a certain time without rest. The great time for the recuperation of the brain cells was during sleep, when the brain was in such a condition that ordinary stimuli did not excite its cells. When asleep, sounds, light, touches, &c., of which they would be well aware during their waking moments, made no impression on them. There were various degrees of sleep, and if they began at the most profound, and went on to the lightest, they came, just before waking, to the degree of sleep when dreams were possible.

A dream might be termed "a train of thought occurring during a slight degree of sleep." It had been much debated whether dreams ever lasted a long time, and it had been held by some that all dreams, no matter to how long a period of time they seemed to relate, were in reality almost instantaneous. He considered that they had at present no data precise enough to form a definite opinion on that point, though there were cases which showed that if not instantaneous some dreams of apparent length had really occupied a very short time. A dream was the reproduction during the dreaming state of impressions received during the waking state, and usually of impressions received during the time since the last sleep. The main incidents of dreams were suggested most commonly by very slight causes occurring during the preceding waking hours, and the reason they failed to recognize them was because their memories were not good enough to enable them to fix them with precision.

As to the reason why the slighter impressions were more likely to cause dreams than the more intense ones, the lecturer explained that at the time of going to sleep they might arrange the groups of cells in the brain into three classes—(1) Those that had been used during the day and were tired out; (2) Those that had not been used at all; and (3) Those that had been slightly used. As the exhausted cells were less easily excited they could readily understand how it was they seldom dreamed of a subject which had attracted much of their attention the previous day. When the stage of sleep at which dreams were possible was entered upon some stimulus from the exterior entered the brain. That faint stimulus, unequal to exciting the tired, much-used cells, was

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just equal to exciting the hypersensitive, very slightly used cells. To put it in a different way, they might speak of the brain waking up by degrees, as it did in fact in health from almost the beginning of sleep. The first cells to be awake would be the hyper-excitable, partly-used cells, and those only would be conscious whilst the others remained still in the sleeping and unconscious condition.

The lecture was accompanied by a number of diagrams and lantern slides of brain tissues, cells, &c.

February 10th.—T. MATESDORF, Esq., on "Raffaelle's Masterpiece." (Professional.)

The LECTURER, in the course of his introductory remarks, observed that England was fortunate in possessing two sets of art-works of the very first rank—the Parthenon marbles by Pheidias at the British Museum, and the seven cartoons of Raffaelle at South Kensington, among which he proposed to find the great painter's masterpiece. Both these collections ranked so high among what men had achieved that only one other country's possessions could vie with them; for Greece to-day had but ruins, France had very fittingly but the Venus of Milo, and Germany but the Madonna by Raffaelle. Holland and Spain stood the comparison better with noble home-made Rembrandts and Velasquezs, while Italy, of course, with its still countless art treasures, won the race.

Their pride, however, should be in the ownership alone, for hitherto these possessions had remained sterile, fruitless, useless. No English school of sculptors reflected the handling of Pheidias, no historic painting the spirit of Raffaelle, although the cartoons had belonged to them since the deposition of Charles I., and had therefore looked silently upon the efforts and struggles of over two centuries of British art. That they had remained here was the merit of a man who otherwise had but little of the art patron in him—Oliver Cromwell. When the art treasures of Charles I. were dispersed, the stern simplicity of the cartoons touched even Cromwell's iron nature, and he bought them for the nation for £300. If they considered that those cartoons were seven enormous pictures, and that the works of Raffaelle had, ever since he painted them, always commanded the highest prices in the art world, they would readily conceive that that was an extraordinary bargain. No doubt it was explained by the fact that Cromwell's wish to acquire them had become known, for this would naturally scare other competitors away. It was a great pity that with such extraordinary facilities Cromwell should not have purchased more art treasures for the nation. It was only lately that they paid £70,000 for a single picture of Raffaelle's, and to-day a quarter of a million would not buy the South Kensington cartoons if they were for sale in any part of the world.

The great value of those seven pictures was made up of many qualities, but principally it was in this, that they were a successful solution of a problem which the art epoch, called the Renaissance, tried

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to solve, namely, to find for the ideas of Christianity forms as perfect, typical and final as those which had embodied Greek mythology. It had been said that in these representations of scenes from New Testament history Raffaelle conveyed the golden fruit of Christianity into the silver vessels of antiquity. The cartoons had other merits. When Raffaelle painted them in 1516 the Reformation was in the air, and the spirit of the Reformation was in them—in their simple way of speaking out, and in their fidelity to the text.

Mr. Matesdorf then proceeded to describe in detail the seven cartoons, which were beautifully depicted by means of limelight transparencies. In conclusion, the Lecturer said he would give the award to the first cartoon—the miraculous draught of fishes on Lake Gennesaret. There the miracle was quite subordinate; there he saw humble men ennobled, and earnestness and abnegation expressed in forms which all men who could read art might understand—Roman and Protestant, Pope Leo X. and Oliver Cromwell alike—and he saw written all over it the watchword, "Excelsior."

February 24th.—CHARLES J. BILLSON, Esq., M.A., on "The English Novel."

The LECTURER said that though the subject was an immense one his aim was humble. He did not intend to imitate the critic, "who," as Mr. Walter Besant had said, "whenever he is at a loss for something to talk about, has a fling at the English novelist." He simply proposed to give a very slight outline sketch of the history of novel-writing in England, of the rise and growth of fiction in English prose. When they considered that 70 and even 80 per cent. of the books taken out of the Public Free Libraries of the country contained nothing but novels, and that these were the sole literary food of thousands and millions of English-speaking people, it became a matter of great interest and importance to trace the development of this form of literature.

The terribly rapid increase in the number of works of fiction was one of the most striking facts of the time, and they wondered how their remote ancestors contrived to pass their lives without that wealth and variety of entertainment furnished by the modern novel. For they were rather inclined to think of the novel as a modern invention, whereas the fact was that there were very few periods of civilisation in which they had not been written. The Age of Pericles at Athens and the Golden Age of Roman literature were indeed free from this kind of fiction, and the origin of the modern novel was to be found in the decay of classical literature. But ever since the days of Heliodorus and Longus, of Apuleius and Petronius, patriarchs of the tribe of novelists, the appetite for imaginative reproductions of life had grown by what it fed on, until it had acquired its present tyranny.

Before the discovery of printing, and the scarcely less important invention of linen paper, the prose novel could not compete with those

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works of fiction which offered the aids to memory of rhyme and metre, and it was accordingly to the metrical romance and the ballad that they would have to look for the origins of English novel. Before the invasion of William the Conqueror the tales consisted mainly of the incidents of national history, and the Norman minstrels who came over after the conquest introduced into the literature a spirit of chivalry not more heroic but brighter, gayer, and more humane than the old English spirit. First were the Arthurian legends, many of which were written down about the middle of the 12th century in the Latin History of Geoffrey of Monmouth. The result of Geoffrey's deviation from the dry road of the chroniclers was nothing less than the birth of modern fiction.

During the reigns of the Henries and Edwards the popularity of these stories of King Arthur and his knights continued to predominate, until they were at length compiled and published in English prose by Thos. Malory in the reign of Edward IV. This "Morte d'Arthur," which was printed by Caxton 405 years ago, might be regarded as the first of English novels, and it was almost painful to think how many of its successors this first novel had survived. But side by side with the fashionable tales of chivalry had grown up a more homely form of prose fiction, taking its rise from the ballad literature and folk tales of unknown antiquity, among the most celebrated of which was the "Story of Reynard the Fox."

When Queen Elizabeth came to the throne the age of Chivalry had passed away, the order of society was settled upon a more commercial basis, and the nation was not likely to take much interest in the record of purely imaginary and unproductive adventures. The romance of Chivalry would therefore have died a natural death if it had not been artificially rejuvenated from a foreign source. Towards the close of the 16th century the romances of the Spanish peninsula first reached this country, and if they did not positively affect the future of English fiction they helped to delay the appearance of the modern novel. Another kind of romance which took a firmer hold on the taste of those ages was the pastoral romance, which appeared to have been a native growth of the Portuguese, who, from the 14th to the 16th centuries, composed a number of long and languid fictions founded upon the supposed happiness of the lives of shepherds and shepherdesses and their gentle and amorous disposition. The chief points in these pastoral romances bearing on the future history of the novel were—first, the main theme was love, which took the place assigned in other romances to noble acts of chivalry; and secondly, they often introduced contemporary characters and events under a slight disguise. About the same time the Italian "Novella," the artistic tale of every-day life and manners, began to influence our literature. The first great native work of prose fiction since the "Morte d'Arthur," with the exception of Sir Thos. More's "Utopia," was the Euphues of John Lyly, the plot of which consisted in a succession of intrigues, varied by disquisitions about the nature of

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love, education, religion, the manners of the age, and the beauty of Queen Elizabeth. Shortly after came "The Arcadia" of Sir Philip Sidney, the vast popularity of which had had a most disastrous effect upon the development of the novel.

Under the influences of these books a host of lesser novels soon sprang into existence, in which the novel of manners put forth its earliest buds in English air. But in fiction, as in the drama, the taste for representations of real life was generally acquired slowly and developed late. It was not until the novel of manners became the novel of character, nearly two centuries later, that modern fiction reached its maturity. The main features of the pastoral novel remained until about the middle of the 17th century, when the last remnants of the old style of knight-errantry disappeared, and the new type of heroic novel became firmly established.

It was important to notice that it was in the 17th century that English ladies first took to writing novels. The first effect of this innovation was to render the novel more domestic and more addicted to scandal. As Bunyan was the father of the modern novel with a purpose, so Defoe was parent to that brood of stories whose only purpose was to please by a reproduction of every-day life. In this sense Defoe was properly called "the father of the modern English novel," but the title was more native to Bunyan, who first essayed to analyse character and to depict the workings of the heart and conscience. Hitherto this analysis of human conduct and motive had been all but confined to the stage, and it was not until the great days of the English drama were drawing to a close that the essays of Steele and Addison invaded this province and prepared the way for the novel of character.

At length the time was ripe and the man ready—the time, 1740; the man, Samuel Richardson, who, in that year, published the first part of "Pamela." Though not in itself a great novel, it was the beginning and the cause of great novels. It was the coming of age of the modern novel with its reproduction of actual life and manners, its analysis of character, its humour and its pathos.

Within a quarter of a century appeared that wonderful dozen of masterpieces—"Joseph Andrews," "Clarissa," "Tom Jones," "Amelia," "Sir Charles Grandison," "Roderick Random," "Peregrine Pickle," "Rasselas," "Tristram Shandy," "Peter Wilkins," "The Vicar of Wakefield," and "Humphrey Clinker."

In this grand outburst of fiction they could trace not only the artistic elevation of the popular story of common life, the old English tale of fireside and chap-book, but also the humanising and bringing down to earth of the fashionable romance. After this magnificent quarter of a century came the inevitable turn which occurred to every full tide of human affairs. A greater mass of trash and rubbish never disgraced the Press of any country than the ordinary novels that filled and supported the circulating libraries down to the end of the last century. The novel

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was, in fact, suffering from the gaucheries and inexperience of youth, to surmount which required genius, and that was then at its ebb.

The first kind of reaction was an attempted recurrence to the old idealism, a new species of what might be called "nightmare romance," inaugurated by Horace Walpole. A more capable attempt to withstand the natural development of the art was made by the numerous school of writers who endeavoured to substitute for the presentation of character the interest of a strong moral or political purpose. This revival of the spirit of the old sermon-tales coincided with the time of the great French Revolution, and was inspired from that focus of paradox. It was a relief to turn from these reactionary novels to a true artist, who appeared in 1811, to carry on the traditions of Richardson and Fanny d'Arblay.

The popularity of Jane Austen's "Sense and Sensibility," and following stories, was enormous and on the verge of extravagance. But her fame was speedily over-shadowed by the colossal genius of Sir Walter Scott, the Shakespeare of novelists, who gathered up in his catholic Waverlies, all the best threads of preceding fiction. In applying to the common novel of manners and character that epical scale of treatment which had prolonged the life of the heroic romance, Scott touched the goal of former novelists, and reached the highest point to which any writer of prose fiction had yet attained.

After alluding to the works of Scott, James, Jane Porter, and other writers, the Lecturer went on to say that until the reign of Queen Victoria no great novel was produced in England during the present century, excepting those of Miss Austen, Sir Walter Scott, Miss Ferrier, and James Morier. The only other novelist of any eminence who published anything before the present reign, if they excepted the juvenile works of Lytton Bulwer, Disraeli, and Ainsworth, was that most delightful of all genial humourists, Thomas Love Peacock, whose first novel, "Headlong Hall," was published in 1816. In the first year of the present reign, however, a popular demand for novels arose, and it was met by the production of a new type of novel. The "Posthumous Papers of the Pickwick Club" proved irresistible, though there were now some signs that its popularity could hardly long survive the decay of those manners of which it was so admirable a picture. During the ten years which succeeded the publication of "Pickwick," two more of Dickens's novels saw the light, namely, "Oliver Twist" and "Old Curiosity Shop." In this decade Lytton Bulwer fell back into that vein of rhetoric and sentiment which was represented in such stories as "Ernest Maltravers," "Alice," and "Zanoni." Disraeli continued his series of political novels, Harrison Ainsworth reproduced the life of Old England with something of the art of the great scene painter, Lever drew inimitable sketches of the lighter phases of the complex Irish character, and Captain Marryat transcribed the humours of the sea. Dickens then reigned supreme in the realm of fiction, without any formidable competitor to dispute his title. But before the half century was over his supremacy was challenged successfully by two other novelists,

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who, almost at the same time, leapt into popularity. Between the years 1846 and 1848 Thackeray published his first great novel, "Vanity Fair," and in 1847 there was also published the autobiography of Jane Eyre, by Charlotte Brontë.

The ten years following 1850 constituted the most glorious decade of the present or any other reign so far as fiction was concerned. Among the works produced during this golden age of novels he mentioned "David Copperfield," "Pendennis," "Tale of Two Cities,' "The Ordeal of Richard Feveril," "Westward Ho," "Esmond," "The Virginians," "Harold," "The Professor," "Villette," "Bleak House," "Little Dorritt," "Great Expectations," "Alton Locke," "Yeast," "Two Years Ago," "Geoffrey Hamlyn," "John Halifax," "Uncle Tom's Cabin," and the two best novels of early Christianity, Kingsley's "Hypatia" and Cardinal Newman's "Callista." Charles Reade during that period wrote "It's Never too Late to Mend," Mrs. Gaskell wrote "Cranford" and "Ruth," while amongst the others were the productions of Ainsworth, Wilkie Collins, James Grant, Mayne Reid, Miss Yonge, Henry Kingsley, Nathaniel Hawthorne, George Eliot, George Borrow, and George Meredith.

After referring to several later novelists, including Walter Besant and Louis Stevenson, the Lecturer said, in conclusion, that if it was true there were hardly any really good novels written now, there were hardly any really bad ones; and as the appetite for fiction had grown somewhat gluttonous, it was perhaps just as well that the supply should consist of a cheap and wholesome abundance rather than of a few rare cates which might fail to satisfy it. If anyone was dissatisfied with his present fare, let him follow the sound example of Hazlitt, and, whenever a new novel was published, read an old one.

March 10th.—Frank E. Beddard, Esq., M.A. (Prosector to the Zoological Society of London and Davis Lecturer), on "The Colours of Animals." (Professional.)

In the course of his preliminary remarks, Mr. Beddard said the subject of the colours of animals was one of the most striking phenomena with which organic nature presented them, and it was therefore not at all surprising to find that those questions of colour had attracted the attention of scientific men for a very long time past. Originally in the olden days of science naturalists were content to describe the colours of animals, without attempting any explanations as to why a particular colour characterised a certain animal; they merely used the infinite diversity of colour as a means of distinguishing the various species from one another. But the publication of Mr. Darwin's "Origin of Species" gave a very strong impetus to another view of the question, namely, to endeavour to explain, if possible, how those various colours have been brought about, and what relation they had, if any, to the life of the animal. And the whole subject of colour had been lately presented in a popular and easily-intelligible form by the publication of Mr. Wallace's work on

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Darwinism. It was a very large subject, and he would not attempt even a summary of the different theories which had been advanced, but would, by means of illustrations, show them some peculiar cases of colour in the animal world.

The earlier naturalists did not regard colour as a legitimate subject for philosophical inquiry, but at the same time they noticed that there was very often a curious relation between the colour of a given animal and its surroundings. For example, insects inhabiting forests and living among trees were frequently coloured green; and, on the other hand, animals which lived amid the eternal snows were coloured white; while those which frequented regions only covered with snow during the winter changed their colour according to the seasons, the colours being evidently put on to protect the animals from their foes.

The Lecturer then proceeded to show a series of limelight views, principally illustrating what was called the protective resemblance of animals of different species to the immediate surroundings in their native habitat.

March 24th.—G. R. KIRWAN, Esq., M.A., on "Early Elizabethan Dramatists."

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DESCRIPTIVE AND HISTORICAL ACCOUNT OF THE CASTLE OF ASHBY-DE-LA-ZOUCH.

By Leonard Fosbrooke. (Read before Section "A.")

Few branches of historical research have been so little studied as that which relates to the Military Architecture of the country.

In our own County we have the excuse, that so few examples have survived up to the present day; for out of fourteen which formerly existed, of only three are there now any considerable remains, viz., Ashby, Leicester, and Kirby Muxloe.

The names of these castles were—

1. Belvoir, built by Robert de Todenei, standard bearer to William the Conqueror. (It was destroyed by Lord Hastings about the year 1470, rebuilt fifty years afterwards by the 1st Earl of Rutland, dismantled by order of the House of Commons in 1648 and restored in 1668. It was being rebuilt at the commencement of the present century when the greater part of it was destroyed by fire, 26th October 1816, but was soon afterwards restored to its present form.)
2. Castle Donnington, founded by Eustace, Baron of Halton, in the 12th century, and destroyed by order of Henry III. in 1216.
3. Groby, founded by Hugh de Grentemaisnel, and demolished by order of King Henry II. in 1176.
4. Earl Shilton, founded by one of the Earls of Leicester.
5. Hinckley, founded by Hugh de Grentemaisnel (who died 1094), and destroyed 1173.
6. Leicester, founded in the time of the Saxons, was nearly destroyed at the Conquest, rebuilt by Hugh de Grentemaisnel, and demolished by Henry II., 1176. It was rebuilt by Simon de Montfort, about 1210.
7. Melton, founded by Roger, Lord Mowbray, about 1160.
8. Mountsorrel, founded by Hugh Lupus, Earl of Chester, in 1074, and destroyed in 1217.
9. Ravenstone, founded by Goisfrid Hauselin, and destroyed by Robert Bossu, one of the Earls of Leicester (1118-1167).
10. Sauvey, founded by Lord Basset, of Welden, and demolished during the Barons Wars.
11. Thorpe Arnold, founded by Ernald de Bois.
12. Whitwick, founded by Hugh de Grentemaisnel, and demolished about 1280.

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13 and 14. ASHBY-DE-LA-ZOUCH and KIRBY MUXLOE, built by William, Lord Hastings, about the year 1474.

These castles, which had been erected by the followers of the Conqueror, for the better security and safety of the Kingdom, became the strongholds of the rebellious barons during the reigns of Henry II., John and Henry III., so that most of them were entirely destroyed by order of the latter King; and though some of them (says Nichols) were afterwards rebuilt, there is not one of them remaining entire; and even the ruins of most of them are entirely defaced. It is said that the total number of castles in the country at this time was 1115.*

To guard against any recurrence of these wars which the barons waged against the King, it afterwards became necessary to apply to him for permission to fortify their residences, and licenses to crenelate (as they were called) were granted by the Sovereign to those of his subjects who rendered him or the country the most service. During the Wars of the Roses these licenses became fewer, and in the reign of Edward IV. only four were granted, of which Ashby was one. A complete list of these is printed in Turner's "Domestic Architecture of the Middle Ages." After the Battle of Bosworth Field, in 1485 (the last of the Roses), the country was at peace until the breaking out of the civil war in the reign of Charles I., when several of these old castles were fortified for their respective parties, and were the means of prolonging the strife; but when the Monarchy was overthrown, and the Commonwealth established, several castles were ordered to be sleighted, and made useless as places of defence. The invention of gunpowder, bringing about a total change in military tactics, the more settled state of the nation, the abolition of the feudal system, the increase of luxury, caused our ancestors, after the termination of the civil war, to relinquish their castles—which had been built more for strength than for comfort—and build themselves more pleasant and airy dwellings. Like the ruins of our old abbeys and monasteries, these castles have been left to the mercy of time, the weather, and the road maker. The more ruinous a building is, the more it seems to be admired by the public, and any attempt at restoration is often met with opposition; whilst ivy (that favourite plague) is encouraged to twine itself over the whole of the masonry, hiding all the architectural detail, and sometimes leaving us little beyond the modern flagpole at the top.

Ashby Castle is by far the largest in the County, and, originally, was one of the largest in the country, but at the present time only a little more than half of it remains. The present buildings were erected on the foundations of an earlier castle, built soon after the Conquest. This is the building mentioned in the novel of "Ivanhoe." There are slight remains of its walls shewing masonry of a very early period. They can be easily distinguished from the ruins of the castle erected by Lord

* Hume, vol. ii. p. 156.

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Hastings, and are found chiefly in the east and west walls of the great Hall, the Butteries, and Kitchen Tower, but so scanty are these remains that it is quite impossible to form any plan of the building as it originally existed.

When the second castle was built, in 1476, it was rectangular in plan, enclosed with four walls, the space enclosed being divided by a range of buildings from the east to the west, forming two courtyards. On three sides of the walls were towers: that on the north being the Gatehouse, on the west the Kitchen Tower, and on the south the Keep. It is supposed that a fourth tower was intended on the east wall, but of this there is no proof.

The buildings between the two courts were the Chapel on the extreme east, the Solar and Cellars, the great Hall, with the Butteries, etc., and the Kitchen. All of these were enclosed within a strong stone wall, but without, on the south, was the garden, enclosed by a brick wall, with irregularly shaped towers at the angles, which were probably summer houses, and are of a date subsequent to the other building; whilst out in the fields, about 170 yards from the castle, is a building, triangular in plan, known as the Mount House. This building is connected by a subterranean passage with the Kitchen Tower, 240 yards long, and another one connects the latter Tower with the Keep.

Having given a general outline of these ruins, we will now examine them in detail, commencing with the Keep, or Earl's Tower.

No castle in the middle ages was complete without a keep, or strong tower, which, in case of disaster, was the last place of retreat. The walls were of immense thickness and height. It was defended by a portcullis, the roof was flat, covered with lead, often embattled and machicolated with smaller towers at the angles, and always stood on the highest part of the ground.

The Keep at Ashby possesses all these features. Owing to the south wall having been destroyed by the Parliamentarians in 1648, it is difficult to ascertain its original size, but it was most probably nearly square, and four stories high, without cellar. Adjoining it on the east side was a smaller tower, of the same height, but divided into seven stories, a circular staircase between the two leading to both sets of apartments. The Keep was a complete house in itself, the larger portion containing a porter's lodge and stores on the ground floor, with cellar under, from which runs a subterranean passage to the Kitchen Tower. Over this was a large hall, with stone-groined roof, occupied as a guard-room or kitchen. There is a large fireplace on the west wall, and on the north wall, over the entrance, is a groove for the portcullis to slide in when raised.

On the third story was a large apartment, with a fine angular window in one corner of the room, which externally forms the base of one of the angular turrets. The uppermost room, or state room, shews a chimney-piece of most beautiful design, enriched with the arms of the Hastings, with a window on each side, having seats formed in the thickness of the

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wall. The window to the left of the fireplace has a passage in the wall leading to the middle portion of the turret before mentioned. At the extreme right of the fireplace was a door leading to the staircase which now ascends to the top of the tower, but the roof over the whole of the building having been destroyed, we must be content to remain on the small platform surrounded by battlements, which were, with the steps, restored some years ago by the late Marquis of Hastings. The towers which stood at the angles and were raised above the roof are destroyed, but the machicolations still remain. These were formed of three stone corbels, each one projecting farther than the one beneath it, on the last of which came the parapet wall. The space between the parapet and the wall thus formed a kind of grating, through which boiling water, molten lead, stones, arrows, or other missiles might be let fall on the heads of the besiegers below. In other Castles these are often found only over the entrance gates, so that water might be poured down if the enemy attempted to burn them; but at Ashby they are on all the exterior walls. The staircase, too, is loopholed the whole height.

The rooms on the east side of this tower were much smaller than those on the west, and were probably the sleeping apartments. The two uppermost, from the more ornamental character of the windows, etc., were occupied by the lord and his family, those beneath by the men-at-arms and the servants of the household. They seem to have had wooden floors, as the joist-holes are distinctly seen to each apartment. A doorway from one of these rooms led on to the wall, and there must have been the same means of communication from the guard-room to the wall running west.

The entrance to the Keep is on the north side from the lower court-yard, and within the walls of defence. It is a small door, 3 feet 8 inches wide and 8 feet high, surrounded with rich Gothic mouldings, above which, in a niche at a considerable height, are the arms of Hastings, on a shield encircled by the garter and surmounted by the helmet and crest, from which falls a graceful mantling. The whole is supported by two small grotesque figures in a kneeling attitude. The top stone, which probably bore the coronet, is missing. The arms of Hastings, a maunch, are also carved on the bottom corbel-stones of the turrets.

When the Castle was destroyed in 1648, the Keep and the Kitchen Tower were ordered to be sleighted, which was a military term for taking out one side of a building, so that it might afford no protection for an enemy inside. Consequently the south side of this tower was levelled to the ground, and has never been rebuilt. The cellar has long been filled up, and there is now no means of communication between this and the Kitchen Tower. The height of the Keep, from the ground to the top of the machicolations is about 80 feet.

Crossing the lower court-yard, we arrive at the Chapel, a building of splendid proportion, but fast falling to decay. An engraving of the Castle, published by Buck in 1730, shews it complete, with battlements

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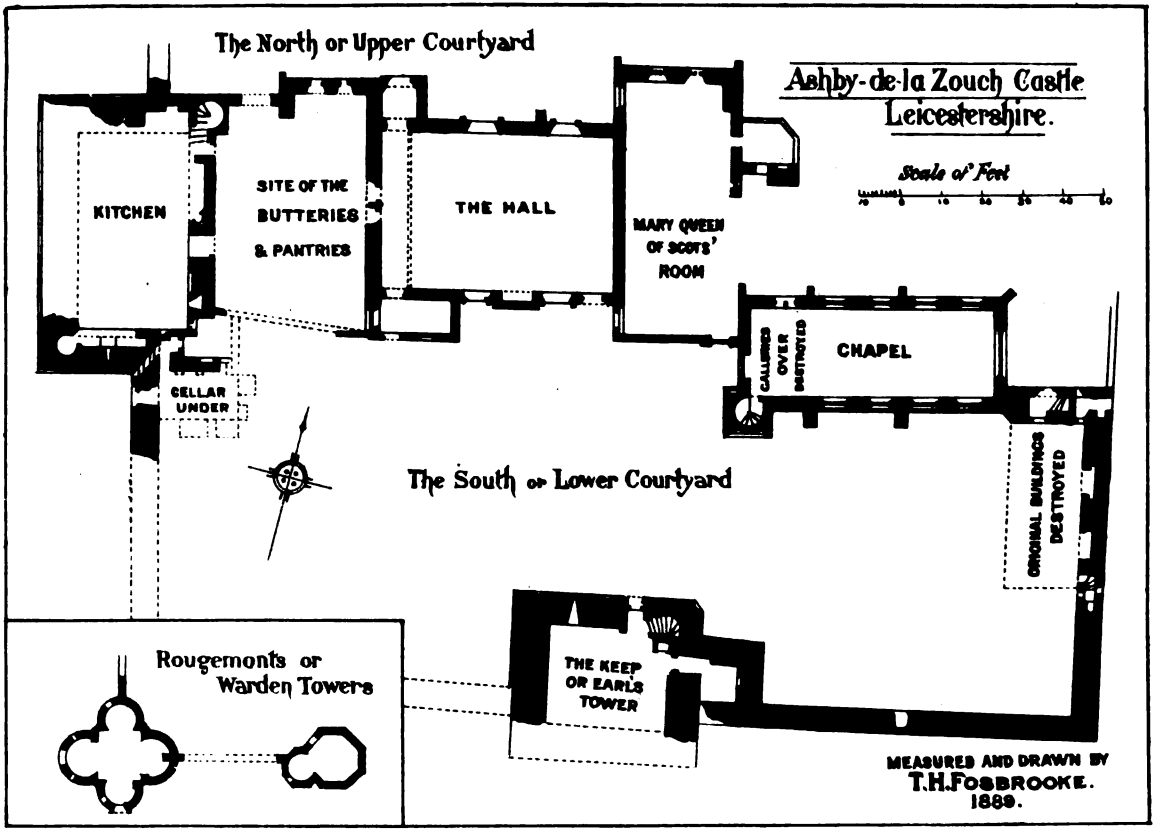

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and roof and the tracery in the windows, none of which at the present day exist. It is 60 feet long by 21 wide, and was lighted by four large windows on each side, and one large one at the east end. At the south-west angle is a square tower, containing a staircase which led to two wooden galleries, the lower one of which had also communication with the Solar, and being occupied by the lord and his family, and the upper one by the servants or retainers. On the south wall is a piscina, and in the north wall a door which led into the upper court-yard, but is now blocked up. This chapel is of the same date as the keep, and was probably erected by the first Lord Hastings about the year 1480.

Between the chapel and the kitchen tower is the Great Hall where all the yeomen dined, whilst the Earl with his family and friends dined in the great chamber adjoining, and now known as Mary Queen of Scots' Room. This Hall was only one story high, and had a wooden pitched roof with a large ventilator in the centre. It is 57 feet long by 38 feet wide. It is lighted by four large semi-circular headed windows, two on each side, and, according to Grose's views in his "Antiquities," there was a circular window in each gable end. In the west wall are two doorways leading to the butteries and kitchen, and on each side is a porch leading into the upper or lower court-yards. In the south porch was a staircase to a minstrels' gallery over the screens, but all now wanting. There was another entrance on the south side leading to another staircase which led to the Solar, with the cellars under, and between these two entrances was the fireplace, with a window on each side. This is the Great Hall as it now is, but formerly the buildings here must have been very different, for at the ends of the Hall, on the east and west walls, are two semi-octagonal pilasters, from which at one time sprang the ribs of a groined roof. It is very probable that at one time there were many small offices here, which were cleared away and the areas all thrown in one to make the great Hall, and these pilasters (two of them behind the screens) were allowed to remain. It is in this building that the remains of the earlier Castle are chiefly to be found, especially in the west wall, whilst the north and south walls are of the latest form of architecture, and were probably built as we now see them about the time of James I., perhaps for the entertainment of that monarch in 1617. Buck's view from the north shews this building to be roofed with slates, and there is no doubt that some of these buildings were occupied or inhabited in the last century.

Between the Hall and the Chapel was the Solar, or the private room of the Lord of the Castle, and is now known as Mary Queen of Scots' Room, whilst underneath it were the cellars, the same arrangement existing at Berkeley Castle. In the household book of the Earl of Huntingdon in 1609, published in Nichols' "History of Leicestershire," this room is styled the "great or withdrawinge chamber," and from an entry in the same it appears that the Earl dined here, and his gentlemen and yeomen in the hall. It must have been a magnificent apartment at one time, as shewn by the remains of a handsome chimney-

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piece on the west wall, and a large mullioned and transomed window of twelve lights in the gable end. Opposite the fireplace were a set of smaller apartments, but only enough of the walls is left to shew that they once existed.

The Solar was on a higher level than the Hall, and was approached from the southern court-yard, close to the hall entrance, by a flight of steps, of which at the present day there are no remains. On the top of these steps was the door leading into the Solar, whilst that forward led into the private gallery of the chapel. This, like the Hall, retained its roof in 1730.

Between the Hall and the Kitchen were the Butteries, and over these was a small room called the Oriel, connected by a passage with the staircase in the Kitchen Tower. This Oriel room was a retiring room for the minstrels. As late as the year 1780 there stood on this site a three-story building, gabled to the upper and lower courts, which, however, must have been built at a very late date, and partakes, according to Grose's views, of the character of a house erected about the end of the 17th century, and was no part whatever of the ancient Castle. It might have been erected for a residence of a steward or guardian, after the Hastings family left Ashby, but the window in the north wall is the original window of the Oriel room.

Owing to these later innovations, the restoration of the original plan of the Castle becomes at this point more a matter of supposition than certainty. On the extreme west of this central row of buildings is the Kitchen Tower, and between this and the Butteries was a passage with a flat roof, covered with lead. At the south end of this passage is a hatch, through which the dishes were passed, then taken through the Butteries and deposited at the hall screen. This hatch does not open direct into the Kitchen, but into a smaller room, of which two sides only remain. The floor-line of this passage and that of the Kitchen was about 3 feet lower than that of the Hall; so there must have been another flight of steps here, as well as from the Hall to the Solar. The wall running from the hatch to the porch of the Great Hall is modern.

Lastly, we arrive at the block of buildings known as the Kitchen Tower, on account of the kitchen proper occupying the greater portion of it. It is 52 feet long, 28 feet wide, and about 37 feet high, whilst the walls are not less than 10 feet thick. Like the Keep, this tower was sleighted by the Parliamentarians, and the west wall utterly destroyed from the battlements to the foundations. On its longest side from north to south it was divided by pilasters into three bays, from which sprang the ribs of a groined roof. In one corner of the kitchen, and within the walls of defence, it will be observed, was a circular staircase leading to a set of apartments above, whilst over these, in some parts, there seems to have existed a third. Unfortunately the steps of this staircase are destroyed, with the exception of a few at the bottom; but at about the height of 12 feet from the ground there are two passages leading out

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in the thickness of the wall, one to a window and the other to the oriel previously mentioned.

In the Kitchen there were two immense fireplaces, one on the east wall, the other on the south. That on the east wall was the smaller, and of one flue, with a circular recess in one corner, the object of which it is difficult to determine. Some antiquaries have thought it contained a copper, others that it served as a screen to guard the cook against the excessive heat. Its real use has never yet been explained satisfactorily. The fireplace on the south wall is divided into two, one of these circular recesses coming between them, which is here ventilated by a shaft to the outside of the wall. Over this is a large window, and to the right is the oven. In the south-east corner are two doors, one leading into the serving-room, the other down a flight of much-worn steps into a cellar, from which there are two subterranean passages, the one leading to the Mount House, the other to the Keep, but both now blocked up.

The Kitchen was lighted by two fine mullioned and transomed windows in the east wall, and one in the north and south walls, which latter were outside the walls of defence. On this account we may suppose that there were two more in the west wall, the great height of these windows above the ground and the thickness of the walls rendering it comparatively safe against any weapons that might be shot into the room from without.

At one time a wall ran from the Kitchen Tower in a southerly direction for a distance of 25 yards, and then returned square as far as the centre of the Keep, and a similar one at the east thus made the enclosure of this court-yard complete. The east wall shews four fireplaces, formed in its thickness, and from it originally projected a two-story block of buildings. At the angle is a bastion, and in the south wall a loopholed niche or recess for the sentinel. Of the wall enclosing the northern court-yard, there are no remains beyond a small fragment on the north side of the Kitchen Tower.

To the south of the Castle was the garden, enclosed by a brick wall, at the corners of which are two small towers, known as Rougemonts or Warden Towers, which seem to have been only built as kinds of summer houses, as they would be useless for purposes of defence. These are built of red brick with stone facings, but are fast disappearing before the ravages of time.

The space between the Castle and these towers, known as the Wilderness, is thrown up into mounds in a form very similar to military earthworks, and these were no doubt made by Lord Loughborough or the Parliamentarians during the civil war for the defence or attack of the Castle. The ravelins and other projections are easily seen when looking down upon them from the top of the keep.

Lastly, we must notice a small triangular building of rude workmanship, known as the Mount-house, from which a subterranean passage runs to the Kitchen Tower, but which has lately fallen in. The earthworks round this fort were all levelled about the year 1800, for this

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building was an outpost of great strength. As we shall afterwards see, the exact date of its erection is known, and it was built to annoy the garrison at Cole Orton, for we read that Ashby was in cannon-shot of Cole Orton.

Having thus reviewed the buildings, both in their past and present form, we will pass on to the history of this fortress.

From the time of the compiling of Domesday-Book until the year 1476 there is no authentic account of the erection or existence of any Castle at Ashby. That there was a Castle is proved by the present remains, already mentioned, which shew it to have been erected soon after the Conquest. William the Conqueror gave this manor, with no less than 66 others, to Hugh de Grentemaisnel, who gave it over to his nephew Ivo or John, and it will be remembered that this Hugh erected the Castles of Groby and Hinckley. It afterwards passed into the family of Robert Beaumeis, whose niece married Alan la Zouch. Their son William, who died in 1199, was the first Baron Zouch of Ashby by tenure, and this family gave the affix of Zouch to the town of Ashby.

When Sir Walter Scott was on a visit to Sir George Beaumont at Cole Orton, he visited and inspected Ashby Castle, and studied its history. No doubt it was this visit that furnished him with material for the description of the scene of the tournament in his celebrated romance of "Ivanhoe," which, according to the novel, took place about the year 1194, when the Castle was the property of Roger de Quincy, Earl of Winchester, who was then absent in the Holy Land, and "Prince John in the meanwhile occupied his Castle, and disposed of his remains without scruple." ("Ivanhoe," chap. xiv.)

This is not correct. The title of Earl of Winchester was not created till the year 1210, and Roger de Quincy, above mentioned, succeeded his father as second Baron in 1219. Moreover, the manor continued in the possession of the Zouch family without interruption until the year 1399, when, on the death of Hugh la Zouch, the title of Baron Zouch became extinct, after the family had held the manor for nearly 200 years. Near to Ashby, on the road to Smisby, is a field containing some mounds of earth, and tradition has it that this is the spot where the "Gentle and Joyous Passage of Arms at Ashby" was held, whilst the "deep lane running between two banks overgrown with hazel and holly" is no doubt that part of Ashby known as the Callis. (Chap. xi.)

The next owner of the Castle was Sir Hugh Burnell, who had married Joyce de Botelvart, a distant relative of the Zouch family, and the manor was held by him until his death in 1419. During the unsettled state of the country through the Wars of the Roses the names of the subsequent owners are uncertain, but it was afterwards the property of James Earl of Ormond, who was taken prisoner in the battle of Towton Moor, and afterwards beheaded (May 1st, 1461). Having been a strong supporter of the Lancastrians, his Estates and Castle at Ashby were then confiscated by King Edward IV.

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The life of its next possessor, William Lord Hastings, is too well known to be entered upon here. He was the favourite and confidant of the King, who conferred on him, amongst other honours, the office of Captain of Calais, the richest and highest honour in the gift of the Crown, and created him Baron Hastings of Ashby. When Edward was obliged to flee the Kingdom owing to the temporary restoration of Henry VI., Lord Hastings was the only man who went with him, and afterwards, at the battle of Barnet, was foremost in command. For services so distinguished, nothing could be denied him; accordingly, when the King was at Nottingham in 1474, he gave license to Lord Hastings to inclose and impark 3000 acres of land and wood in Ashby-de-la-Zouch, 2000 in Bagworth and 2000 in Kirby, and to erect fortified houses of lime and stone in these different places.

This license is dated April 17th, 1474, and therefore we have the exact date at which the Castle was built. Burton, in his "History of Ashby," says Lord Hastings "built there a large and fair house, and one stone tower of great height, strength, and excellent workmanship;" whilst a note at the bottom of Bucks' view says that he had license to make a Castle of this manor-house, unto which he *adjoined* a stone tower. From this it would appear that the manor-house was erected previous to this license, and afterwards fortified, whilst the one stone tower was erected entirely at this date. Leland tells us that the lead for building the Castle was brought from Belvoir Castle and the manor-house of Stoke Daubenny, both of which Lord Hastings destroyed. The Castle was environed by three well-wooded parks—the Great Park, which was three miles in circumference, Brostepp Park for fallow deer, and the Little Park for red deer.

This was the home of Lord Hastings, the most important nobleman of that age, in whose retinue were no less than two lords, nine knights, fifty-eight esquires, and twenty gentlemen. But this pomp was of short duration, and upon the death of Edward, he was accused by Richard III. of treason, and beheaded on Tower Green (June 13, 1483).

He was succeeded by his son, Edward Lord Hastings, whose son George was created the first Earl of Huntingdon, in 1529. His grandson Henry, third Earl of Huntingdon, was appointed, in September, 1562, with the Earls of Shrewsbury and Hereford, to guard the Queen of Scots, then a prisoner in Tutbury Castle, and two months after received an order for her removal, which was "dated at Windsore, the 22nd of Novembre, in the twelfth year of our reigne." Consequently Mary was removed from Tutbury Castle to that of Ashby, in which she was for a short time confined; but as she was soon afterwards removed to Coventry, no doubt Ashby was only used as a sort of resting-place. Tradition has it that she was confined in the room called the Solar, which is now known as Mary Queen of Scots' Room; but I hear that the room that was originally so called was pulled down when the present manor-house was built.

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The next event in the history of the Castle was the entertainment given by George, the fourth Earl of Huntingdon, to Queen Anne (wife of James I.) and their son Prince Henry, who were on their way from York to London. A letter is extant in which the Earl of Huntingdon asks the Earl of Shrewsbury to use his influence in procuring a visit of the Queen, and is dated June 13th, 1603, and the visit took place a fortnight afterwards—three months only after the death of Elizabeth. The Earl, however, did not long survive this event; he died the year following, and was succeeded by his grandson Henry, the fifth Earl of Huntingdon.

The Castle now was kept up by this nobleman in a style worthy of a sovereign, and the manner of living was on a most princely scale. He issued a set of rules for the management of his household, which is dated 1609. This household-book contains the duties of all his officers, which are divided under different heads, and from which we gather the every-day life of the occupants within the Castle walls. His principal officer was the Steward, and amongst others were the Gentleman of the Horse, the Gentleman Usher, the Usher of the Hall, the Yeoman of the Pantry, the Yeoman of the Buttery, the Chaplain, the Clerk of the Kitchen, the Almoner, etc.

In August, 1606, the Countess of Derby visited her son-in-law, the Earl, at Ashby, and in her honor a mask was performed at the Castle. It was specially written by John Marston, and was entitled "The Lord and Ladye of Huntingdon's Entertainment of their right noble mother, Alice, Countess Dower of Derby." A manuscript copy of this mask was in the library of the late Earl of Bridgewater, and an abridged version is printed in Bell's "Huntingdon Peerage."

James I., attended by a numerous suite, next visited the Castle in 1617, and the expense caused by such visit was so great that the Earl was almost ruined. The length of his stay is variously stated from three weeks to two months, and it is well known that it was part of the policy of King James to visit any of his subjects whose power and riches rendered them formidable, and, by his long residence at their expense, to lessen his fortunes, and thus quell any ambition they might have after the Crown. The King had been entertained by the Earl the previous year, at his house in High Street, Leicester (of which building the brick tower is all that now remains), and in consideration of the expense that was likely to fall on the Earl a second time, the Corporation of Leicester generously conferred a yoke of fat oxen, worth, as it is specified, £13 6s. 8d. or £14. On this occasion the dinners were always served up by 30 poor Knights in velvet gowns and gold chains, and the nobility of the district were invited to Ashby to pay their respects to the King; but Lord Stanhope of Harrington—a man, as Bell says, somewhat flighty and eccentric—refused to attend. The King, hearing of this, sent for him and reproved him; "But," said the King, "I excuse you, for the people say you are mad." "I may be mad, my Liege Sovereign," said

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Lord Stanhope, "but I am not half so mad as my Lord Huntingdon, who is worried by bloodhounds."

In Blackwood's Magazine for 1841 is a poem on this Royal visit, composed of twenty-nine verses of six lines each. The last word of every verse ends with the word "Ashby-de-la-Zouch," and the poem concludes as follows:—

"The bells did ring,
The gracious King
Enjoy'd his visit much;
And we've been poor—
Er since that hour,
At Ashby-de-la Zouch."

But the days of the Castle were numbered. This noble Earl lived to see his country divided by all the horrors of civil war, and though advanced in years he nevertheless took some part in trying to resist the advance, but without success. He died in 1643. His younger son, Henry Hastings, became the leader of the Royalists in Leicestershire, whilst the Parliament army was generaled by Lord Grey of Groby, son of the Earl of Stamford.

These two men were mortal enemies and deadly rivals, and the feud which had existed long before the breaking out of the civil war now increased. The banner of Hastings was a fiery furnace, on a field gules, with the motto "Quasi Ignis Conflatoris;" whilst that of Lord Grey bore the words "For Religion, King and Country" and "A ma Puissance."

The Earl of Huntingdon's name was placed at the head of the Commission of Array, and was published by Mr. Hastings in Leicester on the 16th of May, 1642, he having marched there from Ashby with a number of colliers, whom he had armed with pikes, muskets and calivers; but meeting with opposition from the High Sheriff (who read the votes of the House of Parliament, in which the Commission was voted illegal), he was driven by the populace to the inn, and the gates were shut. That night their arms were stolen, and Henry Hastings was obliged to run away to Ashby.

Shortly afterwards Mr. Hastings was made Colonel-General of Leicestershire, and by letters patent, dated October 29, 1643, created Baron Hastings of Loughborough, known afterwards as the celebrated Lord Loughborough. The Castle was then fortified by him; earthworks were thrown up and trenches dug, and the place made a secure retreat in the event of disaster. From Ashby Lord Loughborough made several attacks upon the neighbouring villages, and even to the walls of Leicester, where men were placed on guard day and night, and chains put across the bridges to prevent a surprise; whilst on the other hand Lord Grey established garrisons at Leicester Abbey and Bagworth, and supplied the villages with arms and ammunition for their own defence. From these wars a district between Bardon and Bagworth is still called Battle Flat.

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The history of the Castle during these times is well known, on account of the number of letters extant from soldiers in the Parliamentary army, written to their friends in London, which, though shewing a great deal of truth, were nevertheless written with much prejudice. Other accounts of the war round Ashby and the neighbourhood are to be found in the reports and perfect diurnal of the Parliament, Whitlocke, and the diary of a Major Symonds, a soldier in the Parliamentary army.

The first of these letters to be noticed is one written by a Parliamentarian in Leicester to his friend in London, and containing an account of the Castle and its inmates at this date. It is as follows:—

"LESTER, Nov. 14.——SIR, Our forces are gone with Derby horse towards Ashby; but the enemy are very strong and their works good, *they have vaults under the ground, through which they can go from one fort to another at their pleasure;* provisions they have good store; *hung-beef plenty round about their kitchen within,* and have lately been killing and salting of more. There are as debased wicked wretches there as if they had been raked out of hell, as we are informed by some that have come from thence: they have invented a new kind of compliment for a kind of protestation; and if they affirm or deny a thing, it is usual to do it with this saying, '. . . . . ' if such a thing be so, or not so, in their ordinary speech. And this no wonder, for they have three malignant priests there, such as will drink and roar, and domineer and swear, as well as ever a Cabb of them all; and end and begin one health after another; and swear and domineer, so as it would make one's heart to ache, to hear the country people to relate what they heard of them. The Cabb will cozen and cheat one another most wonderfully; steal one another's horses, and ride out and sell them; and sometimes come again, sometimes run away, as if they were at their wits' end. The earl of Huntingdon is in the garrison; but the lord of Loughborough, his brother, is not there; there are also many Irish there, who have lately made *a new fort, a very strong work, and it is called the Irish fort;* who have been bold upon some clashing between them and those that profess themselves to be Protestants in Ashby garrison. The Irish rebels have told them to their faces, that they fight for the old true Catholic Religion, which is better than ours, and puts them in better condition than they that are hereticks; and swear that, if ever they be straitened by a siege, that they will burn the town to the ground. But our forces are gone to try what they can do; and I hope in a short time to give you a further account of their actions."—"Perfect Diurnal," Saturday, November 16.

Here we see the use of these subterranean passages mentioned previously in the description of the Castle, and the new fort called the Irish Fort was no doubt the mount-house. At a considerable height on the kitchen walls are still remaining some strong iron nails driven into the wall, which freely confirms the passage, "hung beef round about their kitchen within."

Two days later we have another letter, dated November 16:—

"We are advertized that the Derby forces, consisting of four troops of horse, have united themselves to the Leicester forces; and that, being ingrossed into one body, they are now advanced to besiege Ashby-de-la-Zouch, which is one of the strongest and most considerable holds that the enemy hath in those places; and, the better to effect their enterprize, they are now fortifying a great house not far from it, a very defensible place of itself, which commands one of the chiefest passages thereunto."—"London Post," Nov. 26.

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We can, from this letter, fix the exact time when the siege of Ashby Castle began, which continued, more or less, till the 28th of February, 1646, or a little over fifteen months; and the following letter, dated 28th November, 1644, shews us that the house they were fortifying was Cole Orton Hall, and is as follows:—

"This day there came letters from Derby, which certify that the Derby, Nottingham, and Leicester forces are fortifying at Cole Orton, within two miles of Ashby-de-la-Zouch, and that their works go forward apace. And it is further certified, that a party from Cole Orton marched to Ashby-de-la-Zouch, which caused the enemy to retreat, and lie close in the Castle, so that our forces marched into Ashby; and hearing where Hastings had left his store of provisions (whom, it is reported, is himself gone to the King, for certain he is not in Ashby; but his brother the Earl of Huntingdon is there) but had left some provisions at a house in the town; which our forces hearing of, went into Ashby; and the enemy being retreated into the Castle, our forces took carriages, and brought it out into their own quarters at Cole Orton, and sent a summons to the Castle, to require it to be surrendered to them for the service of the King and Parliament; but, being denied, go forward with their works at Cole Orton. So that, however, though they do not besiege the Castle, yet they will keep them in, and so secure the country from being plundered by them, and procure free trade and free passage in those parts, which will be a great comfort to them."—"Perfect Occurrences of Parliament," Nov. 22-29.

Another letter of the same date says:—

"The blocking-up of Ashby-de-la-Zouch by the Leicester and Derby forces goes on very well; and the lord Beaumont's house at Cole Orton strongly fortified. There are hopes, if care be taken to prevent the enemy's sending relief, a good account will be given of that garrison in a short time."—"Perfect Occurrences of Parliament," Nov. 25—Dec. 2.

This house at Cole Orton was taken down in 1804, but a portion of the stone wall and a few earthworks still remain. The distance of this fort at Cole Orton from the Castle was exactly two miles, and we read that the garrison at Cole Orton sent cannon-balls into Ashby town, which in those days no doubt was a great distance. One of these balls, weighing 6½lbs., which I produce this evening, was dug up in the neighbourhood some years back.

A letter of December 31st says:—

"The Leicester forces at Cole Orton got in very well, and have lately performed a good piece of service against the enemy at Ashby-de-la-Zouch; where, entering the town, they beat the enemy into the tower, Hastings's strong hold, took divers papers and many arms."—"Perfect Diurnal," Dec. 31.

The tower mentioned in this letter was the keep, and this is the first time since its erection that we hear of its being put to the use for which it was originally intended.

These letters, as before mentioned, having been written by a partizan of the Parliamentarians, relate only the victories of that party, the mention of any success that Lord Loughborough might have obtained being purposely avoided; but the affairs of the Royalists must have been now getting into a very bad state, as the following letters will shew:—

"Feb. 4.—Colonel Hastings, for the King, sent out warrants for carriages to fetch hay to Ashby. The Parliament's forces sent out their warrants to bring the hay

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to Cole Orton; but Hastings was too quick, and had compelled the country to load the hay, and with a strong guard was bringing it to his garrison. Captain Temple, the high-sheriff of the county, having notice thereof, with his troop got between them and Ashby in the van; and three troops of Derby following in the rear, after a little engagement, Hastings's men fled, and were routed and pursued, 40 of them taken prisoners, 60 horse arms, and all their hay."—Whitlock, p. 124.

"Feb. 26.—A party of the Royalists from Ashby attacked Cole Orton, intending to have surprised and plundered the town, but in the attempt lost seventy or eighty of their horse."

On May 24, the King came to Loughborough, and sent some of his forces to Ashby to be quartered at the Castle, whilst he himself went on to Tutbury, where he spent the following day, Sunday. From Tutbury he came to Ashby, where he dined and remained all night, and the next day set out to besiege Leicester. Colonel Hastings then summoned the Cole Orton garrison to surrender, but was met by a defiant answer, and, some of them issuing on the rear of the King's army, took and put to death forty of their cavalry soldiers.

After Leicester had been besieged and taken by the Royalists on the 31st of May, the King appointed Lord Loughborough Governor of Leicester, with a garrison of 1200, and then left to relieve the City of Oxford. The garrison immediately set about repairing the fortifications and walls, and set fire to Leicester Abbey; whilst the Pariamentarians quitted their strongholds of Bagworth, Cole Orton, Kirby and Burleigh.

But when the news of the fall of Leicester was known in London, Sir Thomas Fairfax was ordered to leave the siege of Oxford and proceed with a large force to retake the town. The two armies met at Naseby (June 14, 1645), where the Royalists were routed with great loss, and pursued by the cavalry of Fairfax to the walls of Leicester. "Towards night on that dismal Saturday," writes a Royalist, "we marched (for we had left off running) to Ashby, and here King Charles slept the night, leaving at 10 o'clock next morning for Lichfield, on his retreat to Wales."

Three days after the battle, Hastings surrendered the town to Fairfax, on condition that the garrison should be allowed to march out on the following morning (June 18th) with only staves in their hands to Lichfield. Hastings, however, went to his Castle at Ashby, where he was closely besieged till the following February. In the month following (July, 1645), the town was visited by sickness, and the garrison at one time was reduced to sixty men. The "Parliament's Post," dated August 19th, 1645, says:—"The sickness continueth at Ashby-de-la-Zouch. It is most certain that the garrison soldiers and the Lord Loughborough himself are come out of the house, and do quarter in the Park."

Soon after, however, six hundred men of the King's army joined the garrison, which, animated by the spirit of their gallant leader, made several brilliant and successful sallies, in one of which, says Throsby, a

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Major Pate lost his life. The rigour of the assailants was such that Thomas Davenport, of Hinckley, was fined £20 for selling wine to the besieged.

On February the 7th, 1646, a party of about eighty horse and forty dragoons were dispatched by night from Leicester, under the command of Major Meeres, to Ashby-de-la-Zouch. "He marched," says the account, "with such expedition and privacy that they came to Ashby about eleven o'clock that night, undiscovered, which was about twelve miles march; whither being come, they suddenly surprised the sentinels, fell in at the turnpike, broke the chain, and entered the town, took nearly an hundred of the enemy's horse, being the greater part of the horse of that garrison; whereof fifty were already saddled, and fitted to have gone upon some design of theirs. They took store of arms and other pillage, released divers prisoners, and some countrymen, whom the enemy had taken for ransoms:—and thus having plundered the town, all these our friends returned to Leicester, without the least molestation; the enemy who was in the great house or close, either not receiving the alarm or not daring to come forth at all against them, and thus they came safely back again to Leicester with all their horse, prize and pillage."

This was the climax. Lord Loughborough and the garrison being disheartened by continual losses such as these, exhausted by fatigue and warfare, the scarcity of and great difficulty in procuring provisions, all caused him to accept terms of capitulation. Articles of Agreement were drawn up between Lord Loughborough and Colonel Needham, the Governor of Leicestershire, and submitted to Parliament for its sanction, and were finally ratified on the 28th day of February, 1646. Thus the Castle surrendered, and was not conquered, and from this fact was styled the Maiden Garrison, a name always given to fortresses that had never been actually taken.

The following are the terms of Agreement, divided into eleven items:—

"1. Imprimis, that all the officers and souldiers now at Ashby and under the command of Colonell-Generall Hastings, and that are over and above the number hereafter specified, shall upon Monday next, after the signing hereof (being the 2nd day of March) depart and quit the garrison, and march away, without further stay or continuance there.

"2. Item, that upon the Tuesday following, Colonell-Generall Hastings shall begin to sleight the works and fortifications of the town and garrison of Ashby; and to that end, shall endeavour and procure assistance from the countrie, as well as receive all such as be sent to that purpose; and not forbear until the whole be sleighted and unfortifyed.

"3. Item, that at the end of three months, hereafter specified, Colonell-Generall Hastings shall deliver up Ashby House itself, being now a garrison of the King's, into the hands of his brother the Earl of Huntingdon.

"4. Item, that upon signing these Articles, all prisoners of this Countie whatsoever to be set at libertie, and to have ticketts to go home.

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"5. Item, that sufficient hostages (as such as shall be thought fit by Colonell Needham) be given for the safe return of any convoy that shall be granted by him.

"6. Item, that Colonell-Generall Hastings, with his officers, gentlemen and souldiers, shall have libertie (if they please) to march away to Bridgenorth or Worcester, with their horses, armes and ammunition, bagg and baggage, trumpets sounding, drums beating, colours flying, matches lighted on both ends, muskets loaded, one brass gun, and a case of sacks in boxes, and have sufficient carriage allowed them and six days libertie for their passage.

"7. Item, that Colonell-Generall Hastings, his officers and gentlemen, and also all manner of persons, as well souldiers as others, and that are now members of that garrison, and now belonging to it, shall have libertie to lay down their armes, and have protections to live at home if they please, they submitting to all ordinances of Parliament.

"8. Item, that all the sequestrations of Colonell-Generall Hastings, the Earl of Huntingdon, and Colonel Perkyns (Governor of Ashby House), be taken off, upon the sleighting of Ashby garrison.

"9. Item, that Sir Richard Skeffington and Colonell Needham shall have liberty and power to compound for the estates of such officers and gentlemen as are expressed in the list given in; whether of Leicester, Derby, Stafford, Nottingham, or Warwickshire, or so many of them as shall think fit to compound with them for their estates.

"10. Item, that Colonell-Generall Hastings, with the said gentlemen and their servants that desire to stay with him, not exceeding the number of one hundred, may have free libertie to stay at Ashby for three months after the signing of these Articles; and not to be molested during the said term, for any debts or engagements, or otherwise, by any of the Parliamentary party, they doing nothing prejudiciall to the Parliament.

"11. Item, that Colonel-General Hastings, and the said gentlemen with their servants and horses, not exceeding in number of horse one hundred and fiftie, shall have a sufficient convoye and passe to Hull and Bristoll; and therefrom, by order of Parliament, to have a shipp provided to transport them either to France or Holland, whether they please.

H. LOUGHBOROUGH.
JOHN NEEDHAM.

The news of the surrender arrived in Leicester on the 4th of March following. A Parliamentarian, after quoting the chief items of the Agreement, says:—

"Too good conditions, indeed, for such a desperate and wicked Rob-carryer as Hastings was, but that the Kingdom may be glad to be rid of such wretches. The surrender was made accordingly on Monday, the 2nd instant. We took therein five pieces of ordnance, about 300 arms, little ammunition, and no great store of other provisions,—a great mercy and mighty preservation of the peace and tranquillity of all those adjacent parts about it, for which let God have all due praise and glory."

About this time the Parliament published a catalogue of its victories since the army, under His Excellency Sir Thomas Fairfax, rose from before Oxford. Ashby Castle stands No. 77 in order, and is thus noticed:—"The obtaining that strong and gallant garrison of Ashby-de-la-Zouch upon composition."

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After the Castle was surrendered, a special pass was granted to Lord Loughborough and his relative, Sir Aston Cockayne, to go beyond the seas, in accordance with the eleventh item of the Agreement; but it appears that he still continued to support the Royal cause, and was present at the siege of Colchester (June 13 to August 27, 1648), during what was known as the Second War. He was afterwards taken prisoner, but escaped to the Continent, where he lived in obscurity till the Restoration, when, returning to England, he was created Lord-Lieutenant of Leicestershire. Owing to the hardships, dangers, and fatigue experienced during the civil war, he did not long survive to enjoy the well-earned confidence of his Sovereign. He died, unmarried, January, 1665, and is buried in the Collegiate Chapel of St. George, at Windsor, and with his death the Barony of Hastings of Loughborough became extinct.

In August, 1648, the command of the Castle was given to Thomas Lord Grey of Groby, and the Duke of Hamilton, who was a prisoner in the Castle at that time, was given over to his custody.

But on the 28th of November following, a Committee, appointed by the House of Commons, sat at Leicester to debate on the state of the castles, garrisons, and other fortified places in the Kingdom, and determine which should be destroyed and which should be kept in repair for the use of Parliament. They then resolved that Ashby Castle should be sleighted and destroyed, and that James Earl of Cambridge, then a prisoner in the Castle for high treason, should be committed close prisoner to Windsor Castle. Several members of the Committee were appointed to view the garrison, who decided that it should be destroyed by undermining and gunpowder, and they appointed William Bainbrigg, of Lockington, in the County of Leicester, to carry the decision of the Committee into effect, and a party of horse was given under his command whilst he was thus occupied.

The old house on the north side of Market Street, of the town of Ashby, near to where the old cross stood, is, according to tradition, the house where Bainbrigg lived whilst he was occupied in destroying the Castle; and the gable end is still ornamented with the arms of Cromwell in relief.

Thus fell the Castle of the Hastings, Earls of Huntingdon—now useless either as a place of residence or defence. The family retired to Castle Donington, and the Castle was never afterwards restored, but left to fall into gradual decay and delapidation.

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SPIDERS.

By Rev. W. Agar. (Read before Section "D.")

Spiders form a connecting link between the two great classes of Crustacea and Insecta, being closely allied to both by structural resemblances. They differ from the Crustacea mainly in the form of their breathing apparatus, in not possessing more than four pairs of legs, in the eyes being always sessile, and never placed like those of some of the Crustacea on long peduncles, and in the legs being disconnected and distinct from the abdomen. They differ chiefly from the Insecta, in the fusing of the head and thorax into one piece—called the cephalothorax, in possessing four instead of three pairs of legs, and in being destitute of wings.

If we examine the body of a spider, we find that it is all but divided into two parts. The fore part consists of the head and thorax, *always joined* into one piece. Connected with this cephalothorax are the eight jointed legs. The nature of this part is hard and horny. Joined to this fore part by a short narrow stalk is the hind part or abdomen. This is soft and unsegmented, except in the scorpion.

The mouth part of the spider consists of a lip, two maxillæ or sharp pincer-like jaws, used for masticating and expressing the juices from insects; and outside these, two short strong mandibles, by means of which the creature can seize, retain and kill the insects upon which he preys. At the end of these mandibles is a pointed perforated hollow hook, connected with a poisonous gland. Outside these are two elongated antennæ-like bodies, called the maxillary palpi. In the male spider these maxillary palpi are considerably enlarged at the end, and converted into singular organs, playing an important part in the reproductive process.

The spider possesses two, four, or in the majority of species *eight* eyes. These are simple, not compound in structure as in the butterfly. They are situated behind the mouth and raised on a little eminence, called the "watch-tower." The fore legs and parts of the head of some spiders are so elevated that, if it were not for this watch-tower to raise the eyes, many of them would be prevented from seeing objects in front. The number and relative size of the eyes, the mode of their distribution, in groups of two or four, or in lines and curves, form one of the chief marks relied upon in classification.

The legs, again, varying in length and in the size of each joint, afford another reliable distinction in grouping them into separate families. We find that the end of each leg generally terminates in a forked claw or claws, and the hindermost one has not only claws but a moveable

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spine, by the use of which the creature gets a firm grip of the thread he is paying out and can prevent it from sticking to any object before required. If you watch a spider paying out his thread you will find the hindermost leg stretched back, with the threads lodging between the claws at the end, which fulfil the same purpose as the guides in a spinning machine.

Some spiders have two rows of parallel moveable spines, on the last joint of the posterior leg, forming a kind of curling machine. These are the spiders that make the delicate tangled webs round holes and crevices —looking white and fluffy, as though hoary with age.

An elongated vessel in the middle superior part of the abdomen performs the office analogous to the function of the heart. Respiration is performed chiefly by means of pulmonary sacs, or vessels situated just under the integuments, by branching tubes—trachea—or by a combination of both. The sacs or tubes communicate with the air by means of minute apertures, called stigmata. The nervous system consists of two ganglions, situated in the cephalothorax and branching over the body.

And now we come to a most distinctive feature about the spider,—namely, the organs from which the threads issue, called spinnerets. These spinnerets are placed underneath the abdomen, a little removed from its extremity; so that when the creature is descending by means of its thread it always hangs with its head downwards. The spinnerets, or spinning mammulæ, are teat-like bodies, four, five, six, or even in some cases eight in number. At their extremities they are thickly covered with hair-like tubes. The viscid fluid secreted and stored within can be expressed at the will of the spider through these innumerable hair-like appendages. It is roughly estimated that one of these spinnerets contains something like one thousand tubes. These inconceivably slender threads all join together at about an eighth or a tenth of an inch from the body, and form a single strand. Each thread, therefore, of a spider is made up of, say four or five thousand very much finer threads.

Blackwall, in his work on "British Spiders," states—though I have never found it mentioned in any other work on the subject—that the threads from one spinneret join first and then are afterwards joined to the combined threads coming from the other spinnerets. It is interesting to notice and remember that in the larvæ of butterflies and moths, the tenacious fluid that forms the cocoon comes from the secreting gland by two long channels that meet and join near the mouth of the caterpillar, and issues from a single aperture. In the case of the spider, the delicate threads expressed from the spinnerets do not join inside, but *outside* the body. The use of these remarkably fine tubes seems to be that the fluid, being expressed through so many openings, is thus exposed to a larger surface of air, and so dries and hardens much more speedily than it would if emitted in a single stream of greater density.

Turning from the structure and parts of spiders to their organs of sense, little can be found out respecting their power of hearing and smelling. They exercise some choice in their articles of diet, showing

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that the sense of taste is not deficient. One would think that with eight eyes their vision must be very keen; but judging from experience, I should seriously doubt the probability of a spider seeing either a long distance or seeing any distance very keenly and clearly. If you place obstacles in their path again and again they do not seem to observe them until very close, and then more by touch than sight. Place a spider on a stick; it will walk up and down, and never seem to know when near the ends until, moving its legs round many times in space, it realizes that it can go no further. I should conclude that spiders are near-sighted creatures.

One fact is certain,—that their sense of touch is the most highly developed of any possessed by them. Watch the common geometrical spider of our window-panes *(Epeïra callophylla)*. Look at her when you may—even in the night—the tip of her fore leg is always found upon the leading line stretching from her retreat to the centre of her web. If she is not sure of the nature of the thing entangled, she brings the tip of her other front leg and shakes it to make sure that it is worth her while to leave her hiding-place. Let me say here that my experiments lead me to think that the legs of the spider, in their delicacy of touch, their facility for all kinds of movements, in the power possessed to guide and regulate the thread while spinning, in curling, winding, advancing, retreating,—the legs of the creature seem the most wonderful of anything about it.

And now a word or two about the life-history of the spider. Many species enclose their eggs in a loosely constructed web or cocoon, in some dark corner of a room, outhouse, crevice, small burrows in sand, or in any convenient place. Some spiders weave a close silken bag to contain their eggs, either carrying it with them or hanging it in any suitable spot, and watching over it with the greatest care. An instance of this maternal fidelity lately came under my notice. I found two bags of eggs under a board in a greenhouse, carefully suspended by interlacing threads and with the mother spider keeping strict guard and watch. The board had to be removed, and the threads became disarranged. The spider was driven away several times, but never failed to return. On leaving her for a day or two, I discovered that she had dragged the bags into the dark, hung them again by innumerable lines, and was still on guard. I placed her with the eggs in a small box, and on opening it a little afterwards I found she had again hung up her bags as carefully as before.

The Gorse Spider *(Agelena brunnea)*, with its allies, constructs on its favourite bush a cocoon of pure white thread, in shape something similar to an inverted wine-glass. Some little time afterwards, apparently the better to conceal the treasure, the spider daubs the cocoon all over with mud, until it resembles the plant upon which it is placed. This peculiar instinct is not confined to this spider. A large number of eggs remain through the wintry months to be hatched in the following spring or summer, while a few are hatched in the bright days of autumn. The young spiders emerge from the egg practically perfect, except in size.

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Before arriving at maturity they undergo several moults, changing their outer coat generally three or four times. This is all the tranformation they undergo.

I watched a female spider *(Epeïra diadema)*, who had taken up her lodgings for the winter under a loose bit of wall-paper, close to a kitchen ceiling. This position being exposed to great heat, the young spiders speedily appeared, dropping down by their threads from the top of the window-blinds, spinning their webs all over the window. When I took them to the door, with their threads flying loose, they elevated their abdomen in the direction of the wind, and when they found, by pulling at it from time to time like a sailor tightening a rope, that the free end of the thread had stuck to some surrounding object, away they went to seek new homes and set up house-keeping for themselves.

These baby spiders appeared to have all the tricks and resources of their parents fully developed. I noticed also that the young came forth in little colonies, and not all together, a few days intervening between the hatchings. As I write (December 17th), I can see another little colony attempting to establish a settlement in the window. The webs constructed by these young spiders are marvellously fine, delicately beautiful, and perfect in every respect. Many mature spiders appear to hide, if not hybernate, in old walls, holes, and corners until the wintry months be past.

I pass on to the habits and homes of spiders. Many naturalists roughly divide them into hunting and stationary spiders. My experience of the hunting or prowling division is very small. In speaking of this large class, any paper would be imperfect without noticing a few of the more remarkable, whose homes and habits are well known to naturalists. Foremost among these is the well known Trap-door Spider of Jamaica. It is one of the burrowing and hunting species. The home is generally found in sandy situations. In form it resembles a long stocking. This tunnel is lined by two layers of silky thread; the one next to the earth is of strong coarse fibre, and the inner one of soft fine material. The top-end of its burrow is closed by a trap-door, made up of layers of thread mixed with earth, fitting exactly flush with the surface of the ground and possessing a strong hinge. When it is closed it is difficult to find its whereabouts. The spider is short, thick set, with strong legs. It hunts its prey generally in the night, and in the day dwells securely at the bottom of its singular burrow.

Another strange hunting spider is one that dwells in the fens of Norfolk and Suffolk, and largely in Cambridgeshire. It is known by the popular name of the Raft Spider. We find it sailing about on little ponds and runlets, seeking for the insects that drop exhausted into the water, or, living therein, come up to the surface for a supply of fresh air. This spider collects bits of sticks, stray leaves and other loose drifting material, binds them together by a few threads, and constructs in this fashion a rough raft. It mounts this raft and drifts about by the help of

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winds, eddies or currents, darting off from time to time to seize its prey, and remounting its little ship to enjoy leisurely its captures.

Here I must mention the Diving Spider *(Argyroneta aquatica)* that inhabits slow streams and ditches, and is said to be common in the vicinity of London. The character of its home and the mode of its life are singular and interesting. The spider constructs its silky home upon stems and leaves of aquatic plants growing beneath the surface of the water. It is shaped like a half of an acorn or egg, with the opening underneath. It fills this silky dome with bubbles of air, bringing them from above, entangled in the long hairs of its abdomen. At the top of this dome it makes a saucer-shaped cocoon to hold its eggs. Here it lives with its head downwards, coming up from time to time to the surface in search of food. This diving-bell habitation, filled with air, shines in the water like silver, and from this peculiarity it has received its generic name.

I might here introduce a few remarks concerning gossamer-webs and their owners and builders. We have all noticed with pleasure, on a fine frosty morning in autumn or the beginning of winter, these glittering lines, stretching far and wide from post or gate, and covering the fields near with their matted sheeny webs. Sometimes these gossamer-webs are found floating in the air at great heights, and occasionally spiders are found ascending or descending upon these aerial rafts. One gentleman mentioned in Kirby and Spence's "Entomology," ascended to a high church-tower, and even there at that height he found many gossamer-webs floating in the air. Early in November, walking over the Victoria Park on a fine bright day, I noticed on the wire rope forming the boundary of the cricket ground horizontal lines of gossamer-web covering the whole of it, each line stretching out two or three yards in length, and not more than a quarter of an inch dividing the separate threads. Looking down the rope—with the eye on the same level or plane—the threads, waving up and down in the sunlight, appeared like hundreds of fountains or innumerable jets of water playing. All the grass everywhere was covered with the matted webs. The palings surrounding part of the Park were studded with gossamer-lines. I found some of the spiders poised on the waving lines, and running to and fro as they swayed up and down. They were all of the same species, black or very dark-brown bodies, with red transparent legs. I watched one of them mount a gate-post, and, elevating its body in the direction of the wind, pay out a line, and then either cutting it or the wind dragging it away, drifted off too quickly for the eye to follow its course.

Great diversity of opinion exists as to the use of these gossamer aerial rafts. Many writers think that the spiders mount up into the air to search for minute insect food. Blackwall, however, thinks that these aerial voyages may have some connection with the dispersion of the broods. It seems to me that this is a probable explanation of this peculiar phenomenon. Though the gossamer-web appears to be the work of one or two species—possibly *young* spiders coming out of their eggs

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in great numbers about this time—I think it is likely that all young spiders may use their lines or matted threads to drift or float about in search of suitable homes.

Experimenting with many spiders on a long stick, both adult and young, I found that while the adult spider, as soon as it found itself isolated and a prisoner, threw or paid out a line or lines, and on their free ends catching a surrounding object, walked along this silky bridge to liberty, several young spiders would, if the wind were but strong enough, either cut themselves adrift or suffer themselves to be carried away on the wings of the wind. When we remember the great number of eggs found in a single cocoon, the wingless condition of the creatures, the difficulty it would be to walk a great distance in search of suitable homes, and likewise the impossibility of their procuring a livelihood in or near the place of their birth, is it not reasonable to suppose that these floating webs answer the same purpose in the dispersion of the young spiders that the pappus of the Compositæ does in the dispersion of each little seed?

While speaking of this singular instinct possessed by so many spiders of throwing out silky bridges, I should like to add that the speed of the lines paid out was always proportionate to the strength of the wind at the time. During the prevalence of a strong wind, the speed of the drifting threads seemed marvellous. It seems likely that the spider presses out the viscid fluid from the spinneret, and that the wind, gentle or rough, draws it out slowly or swiftly. I never found a spider to pay out a line in an enclosed room where the air was quiet. I also noticed that in windy weather the lines appeared at times of great fineness, as though the strength of the wind had kept the innumerable threads apart, and not suffered them to unite as they usually do.

Before speaking of the two or three web-weaving sedentary spiders best known to us, I should like to say a word respecting the reports, from various naturalists, to the effect that certain large spiders found in tropical or hot countries have been known to capture and kill small birds. The reports were long doubted, and are held by many to-day as wild and improbable stories. I have not seen birds caught by spiders; but I have seen a very large bee caught and killed by a very small spider. When I first noticed the capture, the bee was held in the web by one or two legs only, and the little spider was trying apparently in vain to secure the other feet in its toils. Considering the size and power of wing of the bee, it appeared almost certain that it would soon regain its liberty. The bee was about eight or ten times the size of the spider. Leaving the two struggling for a time, I was surprised on returning to find the bee hanging with its head downwards and its feet neatly and closely tied together, quite dead. If it be possible for a very small spider to entrap and kill a very large bee, it does not seem to be improbable that a large tropical spider should be able to entangle and kill a small bird like the humming bird or a small finch.

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The only remark that I am disposed to make concerning the common House Spider—that hangs its dense hammocks in the corners of our back kitchens, hiding its dusky form close by—is to express my surprise at the large number of skeletons of dead spiders to be found in its webs. One of the most common species of geometrical spiders to be found is the *Epeïra callophylla*. It abounds on our window-panes, if we only permit it. The peculiarity in the web of this spider is that it is not a complete circle like that of the common Garden Spider, the *Epeïra diadema*,—it resembles the flat top of a round cake with a slice cut out. One or two radii with their spiral lines are missing, and a strong line is taken in this vacant part from the centre of the web, at a certain angle, to the silky bower or hiding-place of the spider. Its retreat can always be traced by following this free radius or guiding-line.

I have experimented most upon this spider. It is easy to bring it from its hiding-place, with a rush, down to the centre of its web, by throwing upon it at a moderate speed little pellets of paper. When the spider finds out its mistake, it loses little time in disappointed amazement, but cuts the threads one by one round the article until it drops upon the floor. It seems capable of gaining wisdom by experience. You cannot deceive the same spider twice, even if you repeat the trial a day or two after your first experiment.

How do this, and the other species of geometrical spiders, form their webs? It seems difficult to find out for one's self. Most webs appear to be constructed either in the very early hours of morning or in the stillness and darkness of night. It has been again and again demonstrated that the spider can spin its web as accurately and beautifully in the darkness of some box as in the full light of day. It evidently works by touch, and not by sight. The web is probably begun by the spider fastening an end to a wall or window-frame, paying the line out while walking round to the opposite side, then making fast to the other end, and, after strengthening this foundation-thread by supports, constructing another line about parallel with the first. It then probably forms a line midway between these two and at a right angle to them, and makes the first radius by drawing a line from the centre of this to the foundation line, forming the other radii in a similar manner. The spiral line is begun in the middle; the circles are drawn very near to each other at the centre of the web, increasing in width as they approach the circumference. After drawing out and fastening a few spiral lines in the middle, it would seem that the spider sometimes leaves that part and begins to form the outside spiral threads.

I noticed a spider that had completed the inner circles, and was constructing the outside ones nearest the framework. It was interesting to notice how the spider guided the line with her hind leg, stopping from time to time to pull the thread out, and as it crossed each radiating line, stooping to press its spinneret upon it, and fastening the spiral line securely at all these points of contact. It did not complete each spiral line all round, but began to make small segments at the outside, enlarging

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them as it neared the centre. I did not see it complete the web, but from the rate at which it worked I should judge that the structure would take about three quarters of an hour to build.

Each web is said to be rebuilt every twenty-four hours. I watched one or two webs for several days, and it seemed from various indications that they had neither been rebuilt nor even mended. I suspect that spiders, like men, differ very much as to their health, activity and disposition.

The structure of the geometrical web is wonderfully interesting and mysterious. The various lines differ much in their texture, strength and elasticity. Touch with the point of a stick one of the radii, and you will find that it does not adhere. Try one of the lines forming the framework of the web, and the same result will follow. Now touch one of the spiral threads, and it will not only adhere, but will stretch to about three times its former length before breaking. A common lens will reveal the cause of this difference in the texture and elasticity of the various threads forming the various parts of the web. The spiral lines are not only much finer than the radii and the threads forming the framework, but they are covered all along—studded thickly—with little beads of a viscid nature. Wood, in his interesting work, "Homes without Hands," calculates that on an average-sized web of the common Garden Spider there will be about 187,000 of these gluey globules.

Looked at through a lens of moderate power, these spiral lines appear like threads of loosely strung beads of various sizes. Their elasticity is evidently due in a large degree to the presence of these innumerable drops of viscid matter. If you remove them carefully the elasticity largely disappears. The spiral lines alone form the trap. Their stickiness and elasticity answer the double purpose of retaining the prey and preventing the threads from being broken by the violent pulling of the insects or the swaying of the web in windy weather. The chief purpose of the radii and the lines that attach the web to surrounding objects is to support and make a firm foundation for the trap part of the web. There is no necessity, therefore, for the viscid beads on the radii, but only greater stoutness and strength. If a fly should alight on the trap, it could not touch any part without coming in contact with a viscid spiral line.

Here we have apparently a wonderful display of instinctive economy exhibited by the common geometrical spider. To the unaided eye each end of the framework lines that fastens the silky structure to the surrounding objects branches out like a three-tine fork. Under the microscope, each one of these three-fold branches at the end is made up of innumerable threads and covers a comparatively large space. The strength given to these attachments by this compound arrangement must be considerable. The mystery connected with the web is how one thread is made so different in texture and elasticity to the others. We could account for the difference in size and strength by the joining of several finer threads into one, but how the radii should be devoid of viscid

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beads and non-elastic, and the spiral threads should be studded with them and extremely elastic, is at present a complete mystery.

And now I must add a word or two respecting the usual method adopted by this spider to secure and despatch its prey. When a fly settles upon the web, the spider proceeds generally to entangle its legs and wings. It does this usually by cutting the threads around the insect and using these to bind it with. Should these threads be insufficient and the insect large and strong, it will often spin fresh web for the purpose. After the prey is tolerably secure, the spider gives the fatal bite. If the insect is much smaller than itself, it will dispense with the former part of the work, and, after piercing with its hooked mandibles, will at once attach a thread to the prey and tow it up to its retreat. I noticed that one large species of the *Epeira* completely enshrouded the prey, so that you could not see any part of the fly, before tugging it into its corner. The movements of the fly appear to cease in about a minute or a minute and a half after the bite, but I should think that it is very unlikely that it feels pain all this time.

The meals of spiders must necessarily be very irregular. The captures depending upon accident, the spider must sometimes feast and sometimes undergo a compulsory fast. It is to be noticed that a spider will capture an insect and hang it up in his larder until required. Yet notwithstanding this saving habit, spiders must often go for long periods without nourishment. A spider may be so gorged that he will not take the trouble to descend and capture the prey upon its net. One writer declares that he kept a spider eighteen months without food. This seems to be all but incredible. I can vouch for the fact that certain spiders can live without food for over fifteen weeks, and at the end of that period appear lively and strong. A fast of this length seems strange and wonderful. Nothing is known definitely as to the average duration of a spider's life. Some have lived as long as four years, but most spiders in all probability die within a year.

There are many interesting facts connected with the habits and homes of spiders that time prevents me noticing and discussing. It seems a pity that a foolish fear and a silly prejudice, existing in the minds of so many people, should have prevented us from obtaining clearer and more accurate knowledge of the homes and habits of these wonderful creatures. Believing with Tennyson

> "That nothing walks with aimless feet,"

I believe that the commonest object or the meanest creature will amply repay intelligent observation. The utility of the spider in the economy of nature appears to be to keep up that wonderful equilibrium, fulness and variety of life that makes the world the home of so many bright, beautiful, and—may we not say?—on the whole, happy creatures.

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A CONTRIBUTION TO THE PTERYLOGRAPHY OF BIRDS' WINGS.

By W. P. Pycraft, Assistant, Zoological Department, Town Museum, Leicester. (Read before Section "E.")

I obtained my first lesson on the Pterylography of Birds' Wings whilst on a visit to the Natural History Museum at South Kensington some two years ago, in the shape of a series of beautifully prepared specimens, the work of the late Mr. R. S. Wray, B.Sc. Lond., and forming a part of the Index Collection; but my opportunities for adding to the scanty stock of knowledge there gained were of the slightest. I was, however, destined to resume the study at no distant date, for, upon my appointment to the staff of the Town Museum, Leicester, I found the work had been commenced by the Curator, Mr. Montagu Browne, F.Z.S., F.G.S., but (and I congratulated myself upon the fact) owing to the pressing demands upon his time, mainly in the direction of Palæontology, he had been compelled to hold its further progress in abeyance. On my advent, Mr. Browne was so good as to entrust me with the responsibility of continuing and completing the work, which has resulted in the series recently added to the Index Collection of our Museum, and to which Professor Flower, C.B., LL.D., F.R.S., &c., on a recent visit to this institution, was kind enough to accord his warm appreciation.

During my investigations I have, of course, been compelled to seek the assistance of any authors who might have written upon the subject, and to familiarize myself with the literature generally. I was not long in finding out that, in many instances, it was impossible to reconcile their descriptions with the conditions obtaining in the actual specimens, as well as the fact that, in many cases, most interesting features had been entirely overlooked, whilst in others I maintain that false conclusions have been arrived at.

Taking these facts into consideration, I deemed it expedient to commit the results of my labours to paper, trusting that by so doing I should be rendering our knowledge of the subject a little more complete. But I would distinctly have it understood, that I do not by any means wish the following descriptions to be in any sense regarded as affording anything more than a brief review of this study, as I am convinced that a vast amount has yet to be learned, and that I myself shall be corrected, even as I have corrected. For, in my case, as in that of others, the number of specimens available for examination has been comparatively limited, and the difficulty is exaggerated by the necessity of examining freshly killed birds, no satisfactory data being really possible from a diagnosis of "skins."

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The literature of the subject is confined almost exclusively to the Transactions of the various learned Societies, and is very limited. So far as I am aware, only two papers have ever been written devoted to a complete description of the wing, the remainder treating upon special groups of feathers only.

The publication of Nitzsch's "Pterylographie"[1] threw a flood of light upon the distribution of the feathers generally, but contributed little towards our knowledge of the wing-covering, as he confined his observations principally to the remiges, the coverts receiving but slight attention. It was, however, a remarkable work, and up to the present such another has not been written. It was translated into English by Mr. W. S. Dallas, F.L.S., and edited by Mr. P. L. Sclater, M.A., Ph.D., F.R.S., &c., under the auspices of the Ray Society, to the members of which it was issued in 1866.

Nitzsch's work was followed, three years later, by Sundevall's paper "On the Wings of Birds." This was written in Swedish, was twice translated into German, and, finally, from the original Swedish[2] into English, this last good work being again undertaken by Dallas, and published in the "Ibis" for October, 1886. It forms a really valuable contribution to our knowledge of the subject, and was the first of the two papers ever written. The coverts especially are exhaustively and fairly correctly described.

The second and last paper was that of the late Mr. R. S. Wray, B.Sc. Lond.,[3] whose early death was such a severe loss to the staff of the British Museum (Natural History). This beautifully summarises the whole subject,—in fact, a vast amount of information has been crowded into a few pages.

These and some dozen other papers—a list of which will be found at the end of this paper—practically embrace all that has been written on this subject.

In examining the wing of a bird from which all the feathers have been removed, we readily recognize the very apparent arm and fore-arm, but beyond this it is not so easily followed, and we become aware that great changes have taken place,—that, in fact, we are looking at a considerably modified form of the vertebrate fore-limb, in which the second digit has been greatly developed, whilst the first and third are quite rudimentary. We shall also note that from the proximal end of the cubitus there arises a fold of skin, which runs along the whole posterior margin of the wing, and ends at the tip, forming the *ala membrana*. In this fold the remiges or quill feathers are inserted.

Another fold of skin connects the brachium with the trunk behind, and the brachium with the antebrachium in front, and constitutes the *patagium*. The anterior and larger portion is triangular in shape, the base

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[1] Nitzsch, C. L. "System der Pterylographie." Halle, 1840.

[2] Sundevall, C. J. From the Swedish of the Kongl. Vetensk.-Akad. Handlingar, 1843.

[3] Wray, R. S. "On some Points in the Morphology of the Wings of Birds." P.Z.S., 1887.

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extending from the shoulder to the wrist, whilst its two sides follow the outline of the cubitus and arm. This helps to considerably increase the surface of the wing.

Scattered over the dorsal and ventral surfaces of the wing are numerous little elevations marking the points of insertion of the *tectrices* or coverts.

That we may better understand the relations existing between the various series of feathers, I will imagine your attention directed to a wing in which the feathers have been cut short and their vanes removed, leaving the shafts shewing the manner of their insertion, and will take as an example particularly useful for this purpose the wing of the Wild Duck (*Anas boschas*, Linn.), as it may in all respects be considered a typical wing. (See Index Collection *Aves*, Leicester Mus.)

Commencing with the posterior border of the wing, and with the largest feathers, the remiges or quill feathers will come first under notice. These are inserted in the fold of skin just mentioned, with their bases resting upon the bones of the arm and hand. This fold of skin now bears the appearance on the fore-arm of having been divided into a series of compartments, separated from one another by the quills; on the hand, these feathers lie closely together, leaving no interspaces, so that the skin in this region presents a fairly uniform contour.

The REMIGES are divided into two groups: the SECONDARIES or CUBITALS attached to the ulna, and the PRIMARIES attached to the manus. These last feathers have been again divided into *Metacarpals* and *Digitals*, hence they are also called METACARPO-DIGITALS.

Of these two groups the Secondaries are numbered from the wrist inwards, and the Primaries from the wrist outwards, as modifications are most likely to occur at the terminal end of each series.

The Secondaries are nineteen in number. The Primaries are eleven, and are thus disposed: six metacarpals resting upon the slender, bowed, second metacarpal bone, with their roots touching the posterior margin of the first metacarpal; one *alldigital*, attached to the single phalanx of the third digit, its root resting against the metacarpo-digital articulation; two *middigitals*, attached to the posterior half of the first phalanx of the second digit, and lying in two depressions in the bone; and two *predigitals*, one of which, the large 10th quill, is attached to the second phalanx of the second digit, lying parallel with the bone in a groove which extends its whole length, with its root resting against the back of the expanded articular surface, whilst the rudimentary 11th quill or remicle is attached to the tiny third phalanx.

The secondaries do not lie so closely together, being about $\frac{1}{8}$-inch apart. They are attached by their bases to the posterior margin of the ulna. The fifth remex is entirely absent (see p. 133). The fourteenth (see p. 133) is the longest of the series, and the decrease in length from this to the nineteenth is very rapid. The eighteenth is but little longer than its covert, whilst the nineteenth barely exceeds it in length, only the tip being discernable, and is not so broad. To make confusion "worse

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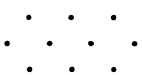
confounded," it rests upon the upper surface of the major covert of the eighteenth quill, so that it lies sandwiched between this and its own covert. This state of things is apparently due to its having been shifted upwards and inwards, so that it is inserted immediately over the humero-ulnar articulation.

The rest of the wing-feathers are known as tectrices or coverts, and are divided into four groups, viz. :—the major coverts, *tectrices majores;* the median coverts, *tectrices mediæ;* the minor coverts, *tectrices minores;* and the marginal coverts, *tectrices marginales.* In addition to these are reckoned the feathers of the pollex, *plumæ pollicis* or "*ala spuria*"; and the humerals, *pennæ humerales*, and axillars, attached respectively to the upper and under surface of the arm (humerus).

They are arranged in rows, the points of insertion thus*:—



so that the vanes of one row cover the interspaces of the row beneath. Thus, inspected superficially, they lie very much in the same manner as tiles on a roof, but the style of imbrication varies: when the outer edge of one feather overlaps the inner edge of the one in front of it, it is said to have a *distal* overlap, when these conditions are reversed, a *proximal* overlap.

The first of the series, as already stated, are the major coverts. They are stiff, well developed feathers, more than half the length of their respective remiges on the cubitus, not quite half as long on the manus.

Of the cubital series there is one to every remex, to which, though intimately attached (being included in the same fold of skin), they are less firmly bound than those of the Primaries, admitting, as they do, of considerable movement in either a forward or backward direction.

They are inserted posteriorly to the remiges, and at a somewhat higher level, their bases resting on the dorsal surface of the ulna, instead of on the posterior margin, so that their roots project beyond those of the remiges, and lie parallel with the anterior margin of the ulna. They cross the quills at a slight angle outward.

The ventral surfaces of the fifth pair are closely approximated, there being, as just stated, no fifth remex.

The innermost series are placed immediately above, and not posteriorly to, the quills.

That of the last remex (19th) is a small, ovate, feather; is quite separate from, and lies somewhat to the inner side of the quill, which it almost equals in size.

* Sundevall, at p. 395 and 414, says "arranged" in quincunx, which is indeed what must result from any such arrangement of three equidistant rows.

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This series is confluent with a development of moderately long feathers (seven in number) on the humerus, known as "humerals" *(pennæ humerales)*. The first is hardly distinguishable from the major covert of the 19th remex; the second is a much larger feather, and the third and fourth are the longest in the series, the remaining three decreasing gradually in size, and connecting the whole with the scapulars.

The first feather rests upon the posterior border of the humerus; the second is inserted slightly higher, though not so high as the following five, the bases of which lie upon the upper or dorsal surface of the humerus; the four largest further differ in that their bases lie parallel and project slightly over the bone, whilst the seventh is only inserted a short distance of its length upon the muscles of the arm, and has no connection with the bone.

Running along the extreme posterior margin of the arm is a row of smaller feathers, each of which is inserted on the inner side of one of the humerals, upon the dorsal surface of which it lies; these probably represent a row of under coverts.

The major coverts on the manus lie closely pressed upon two contiguous primaries, beyond the roots of which their bases project, and rest upon the dorsum of the first metacarpal and digital bones respectively. That of the first metacarpal is represented by a more or less downy feather, attached to the first metacarpal bone, and lying almost parallel with the manus, midway between the first metacarpal and cubital remiges.

The basal half of the quill of the covert of the 11th remex is attached to the distal half of the second phalanx, whilst the remainder of the quill is attached to the third phalanx of the second digit, as well as to the remicle.

Immediately succeeding the majores are the *tectrices mediæ*. On the cubitus they lie parallel with, and anterior to, the major coverts, upon which they are freely moveable; their bases are inserted slightly higher than those of that series, in the interspaces of which they lie.

The distal end of this row seems to be concluded with two feathers lying immediately in front of that of the first metacarpal, terminating at the base of the "ala spuria." Proximally they are continued on to the arm forming the coverts of the humerals. The last of the cubital and the first of the humeral series are much diminished in size, the latter increasing again inwards. The terminal ends of this row are curved abruptly forwards.

In order to thoroughly appreciate this series, it is necessary that it should be studied in the undisturbed wing. It will then be found that it is interrupted over the region of the fifth pair of major coverts (from which the remex has disappeared), and is divided into two unequal halves, the anterior feathers gradually increasing in length inwards up to the fifth feather, which is abruptly longer than the others; of the larger posterior half, the first feather (outwards) is very short, being only $1\frac{3}{8}$ inches long, whilst the tectrix anterior to it (the largest of the anterior

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series) is 1⅝ inches in length; 1½ inches is the proportionate length of the remainder of the proximal series. Perhaps a clearer definition of this modification would be to say that the row is divided into two groups, the smaller terminating in a large feather, the larger commencing with a short feather. Excepting the innermost feathers, the overlap of this series is *proximal*.

There is but one row of median coverts on the manus; the feathers comprising which are inserted, one upon the basal third of the calamus of every remex, excepting the first and second metacarpals.

In the case of the first feather, it will be found to bear a strong resemblance to the majores of the cubitus, both in shape and size. It is inserted over the base of the major covert of the metacarpal remex, and is inclined at about the same angle, so that its distal end crosses the bases of the first two metacarpals, probably causing the suppression of the median covert of the second remex, which is absent. From the third remex to the end of the wing, they are continued as a row of much diminished feathers with a *distal* overlap.

Of the minor coverts, the first row is inserted along the anterior margin of the ulna, close to the bases of the major coverts; the remainder of the group upon the muscular surface of the wing. The fifth and last row follows the outline of the muscles of the fore-arm. A specialisation of these feathers anteriorly forms the *plumæ pollicis*, or "ala spuria." Posteriorly, they cease over the region of the 19th cubital.

On the manus they form a row of small feathers attached to the extreme bases of the primaries, but on reaching the mid-digitals they become confluent with the marginales. These feathers, with the exception of the innermost, have a *proximal* overlap on the cubitus; a *distal* overlap on the manus.

The marginales are seated in several rows on the patagium (four distinct), the anterior consisting of numerous, small, closely set feathers, placed along the extreme edge of the wing, forming its anterior margin for its entire length. The innermost feathers are confluent with the scapulars. All of this series have a *distal* overlap.

Of the under surface:—The *tectrices majores* on the cubitus are firmly attached to the quills, and a dissection is necessary to expose their roots, which are concealed by the cubital muscles; at the same time they have no intimate connection with the ulna. Their shafts lie directly under, and parallel with, those of the remiges. The outer web of each of these feathers is overlapped by the inner web of the preceding *remex*. They are about ¾ths as long as the remiges. Those of the 18th and 19th quills are absent. Those on the hand are wholly dependent upon their respective remiges for attachment, their roots falling short of the bones of the manus. The overlap of this row, both on the cubitus and manus, is *distal*.

The median cubital coverts are much less firmly attached than the same series on the upper surface, being inserted only in the posterior

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wing fold (the ala membrana) and having no connection either with the neighbouring feathers or the bones. In the undisturbed wing the outer and innermost feathers only are seen, the middle of the series being concealed by the minores.

On the manus, they are inserted immediately over the bases of the major coverts, and at a slight angle inwards, so that their shafts lie posteriorly to that series. They cease in the region of the middigitals. The overlap in this row is *proximal*.

The feathers in this and the preceding row lie with their dorsal surfaces upwards and ventral surfaces downwards, like the remiges (see p. 141).

Of the *tectrices minores* there are in all on the cubitus four rows. The points of insertion of the first are just above the bases of the tectrices mediæ. The second and third are separated from one another to a greater extent than are the same rows on the upper surface. The third series is continued on the arm, and appears to become confluent with the axillars. These are a group of feathers, seven in number, lying on the muscular surface of the arm, but having no attachment with the humerus, which runs somewhat behind their bases. In external appearance they are precisely like the humerals of the upper surface, but lack the row of "under" coverts.

In the undisturbed wing the first row is composed of large feathers which, as previously stated, conceal the middle of the row of median coverts. Of the second row the innermost feathers are the largest, the middle of the row being nearly concealed by the third, which is fairly well developed throughout. The fourth row, made up of small feathers, is nearly concealed by the tips of the marginal coverts. The overlap is *proximal* in each row.

Only two rows are represented on the manus, the feathers of the first row are attached to the bases of the primaries and lie parallel with, and in close proximity to, the metacarpal and digital bones, those of the second row running along the ventral surface of the manus. Both rows have a *distal* overlap.

On the cubitus, a considerable down clothed space* separates the last group from the *tectrices marginales*. Of these there are several rows, but only three can be properly distinguished, the anterior feathers being too numerous, small, and closely set, to be satisfactorily made out. They meet those of the upper surface on the extreme anterior edge of the wing, the two surfaces being so completely blended that it is well nigh impossible to define their limits. The marginal coverts of the hand are somewhat larger and less numerous, and become confluent at the tip with the minores. The overlap throughout is *distal*.

This concludes the special description of the wing.

* Both the upper and the under surfaces of the wing are protected by a thick "undergrowth" of down.

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In the following pages the exceptions to, and modifications of, the conditions just described will be discussed, reviewing, as we proceed, the conclusions arrived at by previous writers on this subject.

Sundevall, in describing the relations of the primaries to the bones (p. 400), says: "In number they are usually 10, so that the first is seated upon the outermost (second) finger-joint, attached along its posterior (ulnar) side, less distinctly outwards than the following ones. The second, third, and fourth are placed upon the first finger-joint, and the six following upon the metacarpus." And refers his readers to fig. i. pl. ii. for an illustration.

Now this description is inaccurate, for if we compare it with the conditions obtaining in the Wild Duck, p. 125 (which, excepting the numerical difference of the primaries, is precisely the same), we shall find that the fourth feather, instead of being included with the second and third upon the "first finger-joint," is attached to the phalanx of the third digit, and constitutes the addigital.

Referring to Sundevall's figure, we find the last metacarpal feather, cut short immediately above the articulation of the third phalanx, with the metacarpal bone, and we must therefore assume that it would occupy the position really filled by the first digital (addigital), whilst this latter feather is placed with the two middigitals.

In the next paragraph, speaking of the number of primaries, he says: "The number of primaries varies but little—only between 9 and 11. There are nine of them only in some Song-birds, and this because the first disappears . . . ; and 11 in the genera *Podiceps* . . . . . also . . . *Phœnicopterus*, *Anastomus*, *Tantalus* . . . ." In a footnote to this he says: "In the Diving Ducks (*A. glacialis*, &c.) there is a very small third finger-joint, which has a rudimentary first quill feather, with its small covert-feather . . . ."

Sundevall evidently considers this "first quill feather" to be *extra* to the proper complement, whereas it is nothing more nor less than the remicle, as seen in the Wild Duck, where precisely the same conditions obtain as in the birds he quotes. In many birds, however—*e.g.*, the *Laridæ*—the two predigitals are attached to the same bone; this probably indicates that the third phalanx has anchylosed with the second.

As a matter of fact, the number of primaries is never reduced to nine (except functionally), and may obtain as high as twelve. Indeed all the birds just quoted as possessing eleven primaries actually possess twelve.

The reduction from twelve to eleven is due to the reduction from seven to six of the metacarpal quills. According to Dr. Gadow, there is but one known exception to this rule. He says, P.Z.S., 1888, p. 656, "*Abdimia* stands alone with seven metacarpals, and only one quill carried by the second phalanx of the second digit."

The eleventh quill is *never* fully developed, and is often smaller than its covert. In some instances it quite disappears, though its covert remains attached to the outer side of the 10th primary. In cases,

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however, in which the tenth primary is also rudimentary, the covert also disappears.

In Mr. Wray's paper the remicle is both figured and described as attached to the second phalanx of the second digit. This, however, is not the case. It is indisputably inserted upon the tiny third phalanx. In the *Laridæ* which have two prediginals, *both* are *apparently* attached to the same phalanx (the second), but I take it that the actual relations are precisely the same as those obtaining in the Wild Duck, but that the distal phalanx has anchylosed with the second.

The tenth primary shews every gradation of development from the longest in the wing to a feather so tiny as to be hardly recognisable as a primary at all. It may be seen at its maximum development in *Larus*, and *Cypselus* according to Dr. Gadow.

As an aborted primary it possesses great interest to the morphologist. Its discovery was first made by Baird, who published the results of his investigations in his "Review of American Birds," 1864-66, pp. 160-325. He apparently obtained his cue from a curious anomaly in the wings of the genus *Vireo*, some species of which possessed ten primaries, whilst others appeared to have only nine. An examination revealed the fact that the tenth primary was extremely reduced, in which case it is either hidden from view by its covert or displaced to the outer side of the ninth remex.

This matter is fully treated in a paper by Dr. E. Coues "On the Number of Primaries in Oscines," Bull. Nutt. Ornith. Club, September, 1876, pp. 60-63. An extract of this is given in the "Birds of the Colorado Valley," 1878, by the same author, and the matter is here so clearly explained that I have ventured to quote a part of it. He says:—

"The clue to the search for the apparently wanting primary was given by Baird ('Review,' pp. 160-325), from which it appears that in all those Vireos which seem to have only nine primaries, *two* little feathers, distinct in size and shape and somewhat so in position, are found at the base of the supposed first primary; while in Vireos, with obviously ten primaries, there is only one such little feather. . . . It thus seems to be established that among supposed nine-primaried birds, the additional one, making ten in all, is normally represented by the second one of these tiny quills which overlie the base of the outermost fully-developed feather; it being this same little quill which, in ten-primaried *Oscines*, in *Clamatores*, and probably other birds, comes to the front and constitutes the first regular primary, either remaining quite short, when it is the so-called 'spurious' primary, or lengthening to equal or exceed the other primaries in extent."

"It becomes an interesting question whether *both* of these minute quills be not rudimentary primaries, as one of them certainly is. I have failed to detect any material difference between the two in *size*, *shape*, or *position*. One overlies the other, indeed, as a covert should a primary, but the two are together inserted side by side on the upper side of the first fully-developed quill; both are rigid and accuminate, more like

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primaries than like coverts, and both are abruptly shorter than the true primary coverts. So far, all the evidence favours the supposition that *both* are rudimentary primaries. On the other hand, coloration is against such hypothesis, as in the original case of *Vireo flavifrons*, in which Baird determined the underlying one of these two little feathers to be the missing primary, mainly because it was colored like the primaries, the overlying one resembling the coverts in coloration. But the color test is often inapplicable, coverts and primaries being usually like each other in this respect, and color sometimes points the other way. Thus, in *Sitta cariolinensis*, a ten-primaried Oscine with spurious first primary, the single remaining little feather is white at the base across both webs, like the primaries, the true primary coverts being white only on the inner web."

The degenerated eleventh primary or remicle frequently assumes the colour of the under covert. Thus Dr. Gadow states, in his paper, p. 657, that in *Neophron percnopterus*, the 11th quill is quite white like the lower wing-coverts, not black like the upper coverts and the other primaries. The same is the case with *Grus leucogeranus*; with *Oriolus*, in which the 11th quill is very small and yellow, like the under wing-coverts; and in *Rupicola*, in which it is very tiny and reddish, like the under coverts. I have found that in many of the *Limicolæ* the terminal or 11th quill is white, like the under-wing coverts, whilst its upper covert is dark, like the rest of the series.

While admitting the feasibility of the title of both these little feathers to the rank of primaries, I am more in favour of their being regarded as primary and covert. The uppermost of the two feathers is more constant in size, the principal variation occurring with the underlying feather, which, as has already been shewn, can be found in all gradations of size, from an obsolete feather to the longest in the wing, whilst the uppermost exhibits no such changes, but remains functionally acting as the covert of the underlying, which, though it often exceeds it in length, as in some instances when the 10th primary is very tiny, never exceeds the other coverts of the same series.

If we were to elevate this feather to the rank of a quill, we should, in many instances, have the anomalous condition of a rudimentary primary lying between two well developed ones; for that this is the innermost of the two feathers is evident when examining it in its normal conditions on either a 10 or 11 primaried wing, where it lies *posteriorly* to the quill, as do all the major coverts.

The Secondary or Cubital remiges are a group surrounded with interesting and puzzling modifications. In number, they range from six in the *Trochilidæ* to forty in *Diomedia exulans* (Nitzsch). In form, they are generally shorter and broader than the primaries, and are not so firmly attached to the bone.

The first feather in the *Gallinæ* is considerably shorter than the rest, a fact which Wray considers "due to mechanical requirements in the folding of the wing."

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I have often remarked a very intimate relationship between the cubitals and the primaries. The following instances may aid to explain the matter.

In *Alca Torda* the first two cubital remiges, in order of length, take their places in the half-closed wing with the primaries, both being longer than the remainder of the series to which they belong; the first considerably so, the second but slightly. They further agree with the primaries in that they are not tipped white, as are all but the innermost of the cubital series. Whether these conditions obtain throughout the family, I am at present unable to say, having only examined specimens of this species. In the Barn Owl (*Strix flammea*) the first cubital remex is inserted on the *manus*, and the second upon the extreme distal end of the ulna, as also is the first cubital in the *Gallinæ*, the *Anatidæ* and *Laridæ*, and probably in many others. The same conditions which occur in *S. flammea* will also very likely be discovered in other species.

In Mr. Wray's figure, pl. xxix., the cubital series is incorrectly drawn, inasmuch as the fifteenth remex is represented as the longest, whereas it should be the fourteenth, and all the feathers from this to the end of the series are drawn too long proportionately. This is most noticable in the 19th, which is in reality a small feather, the vanes of which arise almost from its very point of insertion.

The two wings on pl. xxx. are correct so far as the length of the fourteenth and fifteenth feathers are concerned, whilst the two on pl. xxxi., showing the points of insertion of the various feathers, are both minus a quill—the 19th.

A singular fact in connection with this series is, that in many birds the fifth remex is entirely absent, although the major coverts (upper and under) retain their places. Their ventral surfaces are closely approximated, as previously remarked. Up to the present no one has been able to throw any light upon the subject, or in any way account for such a singular anomaly. Wings in which this feather is absent are called *aquincubital*, those in which it is present are termed *quincubital*. This fact seems to have been first brought to light by Gerbe in 1877, and was re-discovered by Wray ten years later.

The latter author considers that probably all birds, with the exception of *Phœnicopterus*, *Gallinæ*, *Passeres* and a few *Picariæ*, will prove to be *aquincubital*. The Goatsuckers, he says, are *aquincubital*, while the Swifts are *quincubital*. But Dr. Gadow, on pp. 658-9, states that *Phœnicopterus* and *Cypselus* are *aquincubital*. In the case of *Cypselus* at least, Wray is right.

The cubital remiges, in rare instances, undergo enormous development, as witness the extraordinary elongated feathers of the Argus Pheasant (*Argus giganteus*, Temm), in many cases the innermost feathers become transformed into flowing plumes *e.g.* Cranes, whilst in others they are simply lengthened, as in *Motacilla*, *Anas*, and *Tringa*. In this case they are invariably sufficiently long to reach nearly to the end of the longest primary in the closed wing.

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The innermost feathers, when differentiated as here described, are generally known as "tertiaries" or "tertials," but they have also been distinguished by other names; so much so that in course of time the terminology, and the feathers indicated, have become decidedly "mixed." Thus the term "tertials" is used by one author to indicate the shortest feathers of the series, whilst another employed it for the "humerals."

Sundevall, in describing the proximal cubital remiges, says, "...when the wing is folded the inner ones usually extend gradually beyond the outer; but a few of the innermost 2-5.....are gradually much diminished in size, and have frequently a different colour and structure from the rest. They are, in this case, softer, more pointed, etc., and both in form and colour resemble the feathers of the back. These have been called *tertiary* wing feathers....." * Whilst in Montagu's Ornithological Dictionary (2nd ed., 1833, p. 555) we find it stated that:—"The *os humerus*...bears what are called the tertials at the outer extremity, and at the other end is articulated into the *scapula*, and usually concealed by the scapular feathers....."

In the 'Naturalist's Library' (Sir W. Jardine) these feathers are called scapulars, tertials, and inner secondaries. Thus, in the description of the Grey Wagtail *(M. melanope)* it is stated that "the wings are dull brownish black, the long *scapulars*† edged with yellowish white."

In that of the Yellow Wagtail *(M. raii)* "the quills and *long secondaries*† are brownish black"; and in describing the genus Alauda, "tertials lengthened." Macgillivray, with his usual correct manner, calls them "inner secondaries." Nitzsch calls them "tertials." In 'Yarrell's British Birds they are called "tertials" and "tertiaries"; and in 'Dresser's Birds of Europe, "long inner secondaries." Sundevall pertinently remarks that the term tertials (as also tertiaries) is an incorrect one, inasmuch as the feathers indicated are attached to the cubitus, and, of course, form a part of the secondaries.

I shall be glad to see the term "inner secondaries" come into general use, it is not only quite as expressive but more correct.

In the *Passeres* the bases of the cubital remiges rest upon the dorsal surface of the ulna, instead of the posterior margin, as described in *Anas boschas.*

The number of cubital remiges in the *Passeres* seems to vary between nine and eleven, whilst the major coverts of the upper surface are constantly eleven in number; so that in those birds possessing only nine remiges, the two innermost coverts remain functionless.

Now we have previously seen that there is a strong relationship between this series and the remiges, and that upon any reduction of the number of the latter, the coverts are the last to disappear.

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* The two innermost major coverts in the *Passeres* would probably have been considered as "tertials."

† The italics are mine.

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Bearing in mind the conditions described on pp. 126-133, I think we may justly assume that these two functionless coverts indicate the absence of a corresponding number of remiges.

The transitional forms can be well studied in the *Turdidæ*, *Alaudidæ*, and *Corvidæ*, and the following descriptions are taken from examples in each of these Families.

In the wing of the Missel Thrush (*Turdus viscivorous*), there are only nine cubital remiges, and consequently there remain two functionless coverts. The outermost is but little smaller than the covert of the ninth remex, and the bases of the two feathers are closely approximated; the innermost is a much smaller feather, inserted quite separately, over the articulation of the humerus and ulna. In colour, both agree with the series of which they form a part, excepting that neither possesses the light outer edge of the others, and that the smaller has a light semicircular patch on the inner web next the shaft.

The Sky Lark (*Alauda arvensis*), has ten cubital remiges, and therefore but one functionless covert. The relationship of both coverts to the rest of the series is precisely the same as in *Turdus*.

In the Rook (*Corvus frugilegus*), the remiges and coverts are equal in number—eleven; so that the latter series is now fully active, and is inserted exactly as in *T. viscivorous*. The relationship between the tenth covert and remex is normal, but in the case of the eleventh covert it is not so, the remex being inserted beneath and somewhat outwards. Similar conditions obtain in the case of the 19th remex in *A. boschas*.

I have only been enabled to examine a few fresh specimens with regard to this matter, so that possibly exceptions may be found; if not, it will prove an interesting discovery, as it adds another instance to the already weighty evidence proving that the development of the wing is accompanied by a corresponding reduction of the number of quills.

I am uncertain as to whether these two coverts were known to Sundevall or not, for, in describing the cubital major coverts, he says (p. 414):—"……there are always one or two more than of the corresponding remiges; thus, externally, there is always one small supernumerary one……" which he affects to figure; but a very little discrimination reveals the fact that the feather he refers to is really a median covert, although this much cannot be gathered from his illustrations, for whatever his intentions may have been, the feather in question was never figured. To the other extra feathers he makes no reference. Probably, however, they formed his "tertials."

The major coverts present some very interesting features, one of which is the strange modification of the first metacarpal covert of this series. In the Wild Duck, as previously pointed out, it is much reduced in size, not being more than one-half the length of its median covert. In the example exhibited in the Museum, it is seen that it is quite a rudimentary, downy feather, there being no vane, owing to the weakness of the barbs; but in another of the same species I found the feather more highly developed, having a vane with downy edges.

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A cursory examination of the wing would not reveal this condition, owing to the fact that it is functionally replaced by the median covert, which, to effect this, has assumed more or less the character of the major coverts, of which more anon.

In the *Passeres* this feather is quite absent. In the *Striges*—*e.g.*, *Strix flammea*—whilst still retaining a downy form, it lies approximated to its remex (the first metacarpal) much in the same manner as the other coverts of the same series.

Amongst the *Gallinæ*, I find in *Perdix cinerea*, *Tetrao tetrix*, and *Lagopus scoticus*, that the feather is not only downy, but, like all the rest of the coverts of the upper surface, it possesses an aftershaft (hyporachis). This fact seems to have escaped the notice of Sundevall when describing the major coverts, for he says, "They are always . . destitute of accessory plumules." *

In the *Limicolæ*—*e.g.*, *Scolopax rusticula*—it is well developed, and lies, as in the Owl, closely approximated to the quill.

In the *Laridæ*, I found it a large, well-developed feather, almost as large as its median covert.

On the under surface of the wing, the majores and mediæ lie with their dorsal and ventral surfaces upwards and downwards, respectively, just as they do on the upper surface. This is quite the reverse of what we should expect to find, and the reverse also of the manner of insertion in the remainder of the feathers. This seems to be due to conditions brought about in the development of the wing, and under that head will be treated presently. This fact is invaluable as a test in the diagnosis of the under surface of the wing, and if we bear in mind the rule (to which I have not yet found an exception) that the majores have a *distal*, and the mediæ a *proximal* overlap, we can tell which of the two series is absent or rudimentary, and to what extent, with absolute certainty, these two series varying in their development much more than the same on the dorsal surface. In the *Passeres*, the majores of the under surface of the wing are present only on the manus, having entirely disappeared from the cubital region. The overlap in this series is *always* distal.

The *tectrices mediæ* of the upper surface have generally a proximal overlap, but in many of the *Gallinæ* and *Columbæ* the overlap is distal. In others, as in the Black Grouse (*Tetrao tetrix*) and Partridge (*Perdix cinerea*), the imbrication of the outer half is *proximal*, whilst that of the inner is *distal*. They are always much diminished in size on the hand, excepting that belonging to the first metacarpal remex.

The mediæ of the lower surface in the *Passeres* are represented only on the cubitus, as a series of small feathers with downy edges, excepting in *Corvus*, *Garrulus*, *Troglodytes* (Sundevall), and *Cinclus*, where they

* Mr. Wray states that he found an aftershaft attached to the major coverts of the ventral surface in the Pheasant. An examination shews, I think, that it should be regarded rather as an inward continuation of the vane on either side. These same conditions are found to exist in the primaries of this and many other species, and no one has as yet, I believe, shewn that these feathers, when fully developed, possess aftershafts. In neither case is there any sign of a shaft, however weak, there being nothing more than a few weak barbs.

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are much stronger. The proportions of these feathers are, I believe, very correctly described in Sundevall's paper, pp. 419-20. In many species of this Order, I have found the bases of the innermost median and minor coverts of the inferior surface inserted together, so that the one appeared like the aftershaft of the other.

The minores and marginales of the upper surface possess no special features of interest. A specialization of the former gives rise to the stiff, quill-like feathers of the thumb, *Plumæ pollicis*. The feathers taking part in its formation vary from 3 to 5 in number.

In the undisturbed wing it is very difficult to separate the two series. Generally, however, it will be found that the t. minores have proximal overlap, whilst the marginales *always* have a distal overlap. Sometimes, however, the t. minores have likewise a distal overlap. To decide the number of rows in either series satisfactorily, it is necessary to examine a wing prepared to shew the points of insertion of the feathers. It will then be seen that the minores do not extend beyond the anterior margin of the cubital muscles. The feathers from this line outwards belong to the marginales.

In the *Passeres* the t. minores are only represented in birds in winter dress and birds of the first year (Sundevall), and then are only found as tiny, downy feathers, comprising from two to three rows, on the cubitus. Thus it is that the wings of *Passeres* exhibit such a small number of coverts, the t. marginales being "brought down" upon the mediæ.

The mode of insertion of the marginales is well seen in this Order, owing perhaps to the smallness of numbers. They lie in little groups of three, one in front of the other, and very close together. Each group is separated slightly from its fellow. The extreme anterior edges of the wing is formed by the approximation of the tips of the marginales of the upper and under surfaces.

The marginales of the lower surface comprise three rows; the proximal feathers of the posterior row are much elongated, and cover the more or less down-clothed surface of the patagium.*

An exhaustive paper on the "Disposition of the Cubital Coverts in Birds" was contributed to the P.Z.S., 1886, by Mr. J. G. Goodchild, F.Z.S., F.G.S., but as has already been pointed out,† the terminology employed is faulty. He appears to found his observations only upon the superficial aspect of the wing, which, as we have already seen, is not to be depended upon.

Referring to the Duck's wing, it will be seen that I have pointed out that the median coverts appeared to be divided into two unequal halves: an anterior, containing fewest but largest feathers, and a posterior, containing smaller feathers.

* There is always a more or less bare space on both surfaces of the patagium, which have been termed by Nitzsch the upper and lower wing spaces. His axillary wing space is probably the posterior fold of the patagium.

† Wray, Morphology Birds' Wings, 1887, p. 349.

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According to the terminology adopted by this author, the anterior third constitutes the "Supplementary row of Median Wing-coverts," the remaining two-thirds the "Posterior row of Median Wing-coverts," which should be continued outwards and forwards, so as to include part of the distal end of the first row of minor coverts. Above this, he makes two, three, or four rows, as the case may be, of median coverts, equal, of course, to the minores; this name he does not employ at all. The marginals he groups under the title of "Lesser Cubital Coverts," and these include the most distal of the minor coverts.

With the exception of these drawbacks, the paper is a valuable one, and forms a basis for the operations of those who may be induced to take up the study with a view to ascertain its value as a classificatory factor. For, as the author remarks, "There can be little doubt.....that up to a certain point there is a remarkable correlation of particular styles of imbrication of the cubital coverts with certain structural characteristics--osteological, myological, visceral, and pterographical; so that, within certain limits, the disposition of the cubital coverts may be taken as a kind of index to the presence or the absence of deeper seated characters, whose importance in relation to taxonomy is generally recognised."

In describing the upper surface of the Wild Duck's wing, I stated that the major coverts were apparently continued on the arm, and formed a group of seven feathers, more or less elongated, called *pennæ humerales*. In adopting this view, I am in direct opposition to Sundevall and Wray, both of whom placed them with the *t. minores*, and as it is necessary to enter somewhat into details in order to sift the matter, I think it advisable to quote the opinions of these two authors.

Sundevall says, "We may so name, although not quite properly, from three to six small, nearly always-concealed feathers which spring from the upper surface of the humerus, close to the apex. They are distinguished, when they are developed, by some resemblance in form to the *remiges cubitales*, and have most frequently a different colour from the dorsal and covert feathers; but if we trace out the series which they form, they are found to constitute a continuation of the *tectrices minores cubitales*. The middle one or more are always the largest." And Wray, in describing the minores, says, "They extend on to the arm, and on the dorsal surface of the humerus a row of six feathers becomes elongated, forming an apparent continuation of the remiges of the forearm, the feathers of the next row taking the form of coverts; they form the humerals (*pennæ humerales*)....."

So far as appears to the contrary, both authors seem to have no other grounds for this assertion, than that the two series can in some way, by a more or less evident gradation, be traced, the one into the other. I will now try to shew the general impracticability of this, and the very apparent connection between the *humerales* and *t. majores*.

In the Duck's wing it was remarked that the last major covert and the first humeral feather were barely distinguishable, and, following up

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the series, found that they gradually increased in length, but quickly assumed definite characters, so that the bases of the largest feathers rested upon, and slightly projected over, the dorsal surface of the humerus, just as do the major coverts on the ulna, which they further resembled in that, attached to their bases, and lying along their outer margins, were a series of feathers assuming the functions of median coverts.

In the *Passeres* we find a row bearing all the essential features of the same in the Wild Duck, only that they are proportionately shorter.

In the Rook (*Corvus frugilegus*) I find the row is composed of seven feathers inserted in a precisely similar manner to that described above. The bases of the first five are parallel, those of the last two lie upon the muscles and run backward to join the terminal end of the scapulars, thus reproducing the conditions obtaining in *Anas boschas*, but differing from that species in that the row of coverts resembling the median coverts are here semi-plumous instead of pennaceous feathers. The lower series, described as probably representing a row of under coverts, are here developed to a proportionately greater extent than in the Wild Duck.

In many species of this Order the innermost major covert differs entirely from the rest of the series in colour, and assumes that of the humerals, from which it can only be distinguished by the fact of its insertion on the cubital, *e.g.*, the Sparrow (*Passer domesticus*) and the Starling (*Sturnus vulgaris*). In other instances, as in the Missel Thrush (*Turdus viscivorous*), the humerals agree in colour with the major coverts.

The only evidence of any real weight that can be adduced in favour of assigning these feathers to the minores is based upon deductions drawn from conditions which affect the under surface, and which in turn affect the axillars, determining beyond doubt the impossibility of these feathers being included with either of the first two rows of cubital coverts, and for the following reasons:—

The majores and mediæ of the under surface *always* lie with their dorsal surfaces *upwards*, as do the remiges, whilst the remaining feathers of the under surface lie with their *dorsal* surfaces *downwards*, as also do the *axillars*, thus proving that they do *not* belong to *either* rows of these first two series.

It may now be argued that if the *humerals* are serial with the *majores* of the upper surface, so should the axillars be serial with that group on the under surface which you have just proved is not the case, consequently the axillars must be considered as belonging to the minores, and the humerals as belonging to the *minores* of the upper surface, as it is practically impossible for two such similar developments to result from specialisation of two distinct series.

My answer is that the feathers clothing the upper surface of the wing were most probably derived from the plumage of the upper surface of the body, as is well illustrated in the *Spheniscidæ*, and the result of the modification in the ordinary Carinate birds, in which the scapulars form the bridge connecting the wing feathers, by means of the humerals, with

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the trunk feathers, by means of the lateral neck track; whilst the axillars perform a like office for the under surface of the wing, connecting it with the under surface of the body, by means of its confluence with the ventral tract (*Pterylæ gastrœa* of Nitzsch); and it has already been shewn (Wray, P.Z.S., 1887) that the majores and mediæ were undeniably derived from the upper surface of the wing, the rest of the feathers, it may be taken for granted I think, were derived from the under surface feathers of the trunk, and if so, they would include the axillars—therefore there need be no special connection between the two, as there is nothing against the possibility of each surface producing separately a similar series. They are probably of a late development: their function seems to be to fill up the gap that would otherwise exist between the remiges and the body, their presence affording a continued surface. This view is, I think, probable; as, in the birds which have short humeri, the special developments of this region are more or less freely developed, whilst birds with long humeri have very long, well developed humerals and axillars.

The number of humerals is variable. According to Sundevall *Picus* has three, *Psittacus* four, and *Coracias* five; but in *Columba* and *Cypselus* they can hardly be distinguished. In *Scolopax*, *Numenius*, *Totanus*, and many smaller Waders, there are five; in *Cygnus*, *Lestris*, and *Colymbus* six; and eight in *Podiceps rubricollis*.

Nitzsch calls this series "The *parapterum*, or plumage on the hinder margin of the upper arm....." But Sundevall says this term seems to have been "employed by Illiger in common for these and the *infra-humerales* and *scapulares*."

In *Struthio*, the wing agrees generally with the conditions found in the *Carinatæ*. The chief differences seem to lie in the superior number of the primaries, the absence of the ala membrana, and the fact that the coverts, although ranging themselves in series, are not disposed in quite the same manner.

The number of primaries is sixteen, of which eight are metacarpals, one addigital, four middigitals and three predigitals. They are inserted on the manus almost at right angles to the bone, and with their bases projecting beyond the anterior margin.

There are from twenty to twenty-three secondary remiges, attached in much the same manner as the primaries.

There is but one row of under coverts.

Rhea (American Ostrich) agrees with many of the *Carinatæ* in possessing twelve primaries, as well as in their distribution. Thus there are seven metacarpals, one addigital, two middigitals and two predigitals.

Apteryx, according to Dr. Gadow, possesses seven metacarpal and five digital remiges.

The presence of cubital quills was first discovered by Professor Flower.

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The greatest departure from the typical wing is found in the *Spheniscidæ*. In this, both in appearance and function, it bears a strong resemblance to a fin or paddle. The feathers, both of the upper and under surface, are very scale-like, the shaft being flat and compressed, and the vanes almost absent. They cannot be divided into series, like other wings, being distributed like the feathers of the trunk uniformly over the surface, but the second and third rows on the cubitus and the second row on the hand show some signs of development, and are supposed to represent the primaries, secondaries, and their coverts of other birds.*

A few words on the development of the wing will, I think, materially assist in explaining what has been said, especially in connection with the relations obtaining at the proximal end of the wing.

Mr. Wray has shewn with admirable clearness that the Bird's wing was probably evolved from a Reptilian manus, and that the early Avian manus was probably a webbed paw, of which the fin-like wing in the *Spheniscidæ* is probably a modified survival; that of the *Ratitæ* is an intermediate stage between that and the ordinary wing. He further explains the anomalous position of the major and median coverts of the under surface, which, as I have previously explained, lie with their dorsal surfaces upwards, as do the remiges; whilst the remainder of the ventral coverts lie with their dorsal surfaces *ventralwards*. He says that in the early wing these feathers were all inserted on the dorsal surface, and have been carried round by the excessive development of the remiges, or, to quote his own words, "That is, originally, on the dorsal surface of the arm and manus there took place a special modification of the scales or feather foretypes, by which rows of these were directed backwards in the 'primitive embryonic' position of the limb. Next, two or three rows begin to be specialised, and to become larger and more prominent than the others; then these, by their unequal growth, carried over a fold of skin and formed the wing membrane, carrying some of the structures to the ventral side, which are now seen as the reversed feathers..... In the embryo bird the feather-rudiments first appear on the dorsal surface, pointing to the fact that the modification here is very ancient and deep seated; the remiges and the greater coverts (superior) being the earliest to appear. Quickly they began to assume larger proportions, and at the very earliest stages the remiges are distinguishable. At this stage the wing is quite rounded in section, there being no trace of the 'ala membrana.' The next feathers to appear are the tectrices majores (inferior), closely followed by the other ventral coverts, the other dorsal coverts meanwhile having appeared. At this stage ..... the inferior major and median coverts are distinctly more on the dorsal half of the rounded edge of the wing than its ventral, but very quickly they become quite ventral, owing to the rapid growth of the remiges. This stage is quickly passed over, but sufficient is visible to shew that these feathers are

* These have been carried round in the development of the wing.

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carried distinctly to the lower surface by inequality of growth. The feathers resulting from these are the plumules seen in the wing of the Duckling, and of no use for flight. The wing of a Duckling reproduces in a great measure, allowing for specialised differences, the adult Ostrich's wing or the Rhea's; and these wings are the survivals of the transition state of the wing, probably never having been used for flight, but having undergone special modifications of their own from that point."

In conclusion, I wish to express my warmest thanks to Mr. Montagu Browne for the loan of books from his private library, and to Mr. A. J. West, of Eastgates, Leicester, Messrs. H. Bond, and H. C. Watson, of Great Yarmouth, for their very great kindness in forwarding me from time to time such freshly killed specimens as they could procure.

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TABLE OF NOMENCLATURE (Modified from Wray).

	WRAY.	SUNDEVALL.	GENERAL.
Dorsal Coverts: *Tectrices superiores.*	Tectrices marginales	= Tectrices minimæ s. antecubitales	= Lesser and least wing coverts. Lesser cubital coverts, (Goodchild). = Tectrices minores.
	„ minores	= „ minores cubiti vel manus	= Minor wing coverts, Middle wing coverts. = Tectrices minores.
	„ mediæ	= „ secundæ seriei	= Middle wing coverts.
	„ majores	= „ majores	= Greater wing coverts.
	Pennæ humerales (serial with the T. majores)	= Pennæ humerales	= Parapterum, *Parapterum superius* (Nitzsch). Humerals.
Remiges.	Primaries or Metacarpo-digitals ...	= Remiges primores	= Primaries.
	Secondaries or Cubitales	= „ cubitales	= Secondaries. Proximal feathers of this series sometimes elongated, then called Tertials or Tertiaries. = Quills.
Ventral Coverts: *Tectrices inferiores.*	Tectrices majores ...	= Tectrices aversæ s. inferiores primæ	= Greater under wing coverts.
	„ mediæ		
	„ minores	= Tectrices infiabrachiales s. plumæ infracubitals ...	=
	Axillaries (serial with the 3rd row of minores) ..	= Plumæ infrahumerales	= Hypopterum, *Parapterum inferius* (Nitzsch). *Infrahumerales.* Axillary plume. Axillars. = Lesser under-wing coverts.
	Tectrices marginales	= Tectrices antecubitales inferiores or inframarginales	=
	Alula or Plumæ pollicis	= Plumæ pollicis	= Alula or Ala spuria. Bastard wing. Thumb feathers.

The *Axillary* tract of Nitzsch = his *humeral* tract, and both = the *scapulars* of authors.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

There have been three Meetings during the last quarter, at which the average attendance was ten.

Papers read:—

January 21st, 1890.—Mr. ROBERT HARVEY, LL.B., "The Elements of Pictorial Effect."

February 18th.—Miss E. A. HAYES, "Criticism Criticised."

March 18th.—Mr. G. P. HARPER, M.A., "Henry Thomas Buckle."

Mr. WILLIAM SIMPSON has been elected Chairman and Mr. J. SCAMPTON has been re-elected Secretary of this Section for the ensuing year.

T. CARTER, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

December 18th, 1889.—Exhibits.—Growing plants of *Drosera rotundifolia* and *D. intermedia*, by Mr. TURNER.

An interesting collection of Moths and *Coccinellidæ*, by Mr. HEADLEY and Mr. BOUSKELL.

Flowering sprays of *Garrya*, *Escallonia*, &c., from Cornwall, by Miss HOTTINGER.

Dr. COOPER said he had observed that snow melted more rapidly on the bark of the Black Poplar than on that of the Lime, and asked if any reason could be suggested for this.

The bark of the Poplar being thick and corky, probably retains heat longer than the more fibrous bark of the Lime.

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Paper on "Spiders," by the Rev. W. AGAR, describing the structure of the *Arachnida*, and the uses of several curious organs peculiar to this class of Invertebrates. The interest of the Paper was greatly enhanced by a number of original observations upon Spiders, both in the open air and when kept in confinement. (Printed at page 114.)

January 15th, 1890.—Exhibits.—A fine example of the very large and uncommon British Spider, *Tegenaria atrica*, with legs over two inches long, caught in a fowl-house in Wharf Street, by Mr. HEADLEY.

Mr. BURFORD remarked that Spiders were proof against strychnine and other alkaloids, but were speedily killed in the ordinary cyanide killing-bottles.

Mr. E. F. COOPER described a variety of experiments he had made in the preservation of Spiders for the Cabinet, no one of which proved satisfactory.

Mr. GRUNDY exhibited a very remarkable creature resembling a little mass of green fluff, ¾ of an inch in diameter, from a coffee plantation in India. It had the appearance of a mite covered with long feathery hairs.

Rev. T. A. PRESTON sent for exhibition a fine collection of Corals and Madrepores, and the CHAIRMAN exhibited a number of Marine Shells, *conus, cypræa, strombus, murex*, &c.

Paper, by the CHAIRMAN, on "The Development of Museums as Public Educators," pointing out the three primary objects of a Public Museum, and the methods by which these objects are best attained; the great want of knowledge on the part of the public as to what Museums might be if they were wisely administered and liberally supported; and the necessity of devoting local Museums chiefly to local objects.

February 19th.—Exhibits.—Flowering sprays of *Azara microphylla*, *Eurybia tomentosa*, *Spiræa Spoeili*, &c., from Cornwall, by Miss HOTTINGER.

A spray of Hawthorn with green leaves half unfolded, from a hedge on the London Road, by Mr. HEADLEY.

A large book containing a number of dried Sea-weeds, by Mr. GRUNDY.

A selection of 109 sheets of dried Sea-weeds from his own Herbarium, by the CHAIRMAN.

A black eruptive Fungus *(Dichomera Laburni)* on Laburnum bark, new to the County, by Mr. VICE.

The CHAIRMAN reported the recent and sudden death from syncope of the Rev. THOMAS NORRIS, of Alexton Rectory, on the eastern borders of

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the County, from whom the botanists of the Section had received considerable assistance and hospitality. A resolution of condolence and sympathy was unanimously passed, which the Chairman was requested to communicate to Mrs. NORRIS.

Paper, on "The Teaching of Botany," by Miss HOTTINGER, advocating such practical methods as her long experience in education had proved to be effective; especially the handling and examination of living plants, the writing of descriptions on prepared schedules, and carefully proceeding from the principal organs, as root, stem, leaf, flower, &c., which are sufficient for young students, to more and more detail.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

December 9th, 1889.—In the absence of the Chairman, Mr. L. HODGES presided.

Mr. E. MOORE, of Beaumanor Villas, Aylestone Road, was elected a Member of the Section, on the proposition of Mr. MONTAGU BROWNE, seconded by Mr. W. P. PYCRAFT.

Mr. T. BURROWS, of King's Newton Street, was also elected an Associate, on the proposition of Mr. H. E. QUILTER, seconded by Mr. MONTAGU BROWNE.

A short communication was then brought forward by Mr. H. E. QUILTER, dealing with some Ammonites recently collected from the Lower Lias of Barrow-on-Soar by Mr. MONTAGU BROWNE, amongst which were found two species new to the County, and one apparently undescribed. The list gave the following species:—

Psiloceras planorbis—two varieties, one being quite smooth, the other presenting "very light bent ribs."
P. johnstoni—typical forms.
P. intermedius—new to the County.
Schlotheimia catenatum—fine series of typical specimens.
Arietites rotiformis—new to the County.
Two specimens of an undescribed Ammonite—probably referable to one of the two new genera, *Psiloceras* or *Ophioceras.*

Mr. MONTAGU BROWNE, F.Z.S., F.G.S., then read a highly important and interesting Paper, entitled "A Contribution to the History of the Lias and Rhætics in Leicestershire," in which he gave the results of

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some six months' continuous work in the neighbourhood of Barrow-on-Soar, in which district he had traced the Rhætics at several points, commencing with their lowest limb (resting upon the tea-green marls of the Keuper) and mounting upwards through the lowest (or *modiola* and *ostrea*) beds of the Lower Lias, through the *planorbis* zone, and finally terminating at the *bucklandi* zone, in which he found some of the new Ammonites before mentioned.

He then proceeded to argue and to show the correlation and synchronism of the Rhætics and Lias of Barrow with the same formations occurring at the Spinney Hills and Wigston, illustrating his remarks by references to memoirs of previous observers, and also by means of large and carefully prepared sections and diagrams.

The CHAIRMAN (Mr. Hodges), in proposing a vote of thanks, spoke of the deep interest with which he had listened to Mr. Browne's account of his labours, which he characterized as forming an important addition to local geological knowledge.

After some remarks by other Members, the vote of thanks was seconded and carried unanimously.

Exhibits.—A number of fossils and rock specimens from the Lias and Rhætic formations of the County, by Mr. MONTAGU BROWNE.

January 20th, 1890.—Mr. C. PARSONS, of the Temperance Hotel, was elected an Associate of the Section, on the proposition of Mr. B. HEADLEY, seconded by Mr. F. BOUSKELL.

The next business was to receive a Paper communicated by the Rev. A. L. SPARKES, a Corresponding Member of the Section, resident at Cordoba, Argentine Republic, entitled "Notes of my Observations at the Great Salina." Most unfortunately, through some unexplained delay, the Paper failed to reach its destination, and an unlooked-for gap was thus caused in the business of the Meeting. A letter was read from Mr. SPARKES, dated 2nd December, 1889, stating that his MS. had been despatched and would be due in England on 6th January, 1890. Under the circumstances, the reading of the Paper was postponed until the April Meeting.

Mr. MONTAGU BROWNE very kindly undertook, at very short notice, to fill the hiatus by an account of his observations on certain extinct fishes of the genus *Dapedius*, in which he stated that, as the result of a careful examination of a large series of specimens—mostly collected recently by himself at Barrow-on-Soar—he had been led to doubt the validity of the grounds on which Louis Agassiz, in his "*Poissons Fossiles*," founded his two species, *Dapedius dorsalis* and *D. monilifer*. Mr. Browne contended that both the forms described by Agassiz were referable to *D. dorsalis*, and explained at length the steps by which he had arrived at that conclusion.

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The CHAIRMAN proposed a vote of thanks to Mr. Browne for his Paper, which was seconded and carried unanimously.

Exhibits.—Fossil fishes of the genus *Dapedius*, from Barrow-on-Soar, by Mr. MONTAGU BROWNE.

Micro-Slides of *Tetranychus tiliarum*, Müll., from Lime trees in the Museum Grounds, and Human Fœtal Tissues, by the SECRETARY.

Portions of the skeleton of a common Fowl, showing arrested development of the left fore-limb, by Mr. W. P. PYCRAFT.

Local Lepidoptera, by Messrs. BOUSKELL and HEADLEY.

February 17th.—Mr. MONTAGU BROWNE stated that since the last Meeting he had been in communication with Mr. A. SMITH WOODWARD, of the British Museum—the well-known palichthyologist—with reference to the contention touching *Dapedius dorsalis* and *D. monilifer*, which formed the subject of a Paper read on January 20th, with the result that Mr. Woodward, after a careful examination of the type specimens in the National collection, had pronounced his arguments to be "reasonable and conclusive."

Messrs. B. LEWITT, of Abbey Park Road, and J. LAWRENCE, of Stoneygate, were elected Associates of the Section.

The Members then adjourned to the Zoological Room of the Museum, where a valuable contribution to Avian morphology, entitled "Pterylosis of the Wing in the Wild Duck (*Anas boscas*, L.)," was read by Mr. W. P. PYCRAFT. (Printed at p. 123.)

Mr. BROWNE, in proposing a vote of thanks, spoke in the highest terms of the ability and research displayed by Mr. Pycraft in the preparation of his Paper, which formed a valuable contribution to the literature of the subject.

A number of beautiful preparations of Wings and Feathers (see Index Collection, Museum) were exhibited to elucidate Mr. Pycraft's remarks.

Mr. A. E. BAKER exhibited specimens of *Helix obvoluta*; *Limnæa peregra*, var. *burnetti*, from Loch Skene, Dumfriesshire; and *Sphærium lacustre*, var. *brochoniana*, collected by Mr. E. PATTISON, at Groby—a new County locality.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. THOMAS CARTER, Mill Hill House.
Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

The Meetings are held the third Tuesday in the month, at seven o'clock, in the Council Room at the Museum.

No Meetings are held during the Summer months.

THOMAS CARTER, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.
Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

FIELD DAYS—The second Wednesday in each Summer month, at about 3 p.m.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

1890.

April 9.—Excursion to Mountsorrel.

,, 16.—Evening Meeting.

1. Exhibition of Leaf and Flower Buds, for the study of Vernation and Æstivation.
2. Paper on "Vernation and Æstivation," by Rev. T. A. PRESTON, M.A.

May 14.—Excursion to Bardon Hill.

,, 21.—Evening Meeting.

1. Exhibition of Caterpillars.
2. Paper on "The Native Leguminosæ of Leicestershire," by Dr. COOPER.

June 11.—Excursion to Wymeswold.

,, 18.—Evening Meeting.

1. Exhibition of various kinds of Wood, useful and ornamental.
2. Paper on "The Native Grasses of Leicestershire," by Dr. FINCH.

F. T. MOTT, *Chairman.*

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SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1890.

April 14.—Paper, communicated by the Rev. A. L. SPARKES, M.A. (Corresponding Member). "Notes of my Observations at the Great Salina." (Illustrated.)

May 19.—Election of Officers. Paper by Mr. MONTAGU BROWNE, F.Z.S., F.G.S., &c. "A Supplementary Contribution to the History of the Fossil Fishes of the Rhætics of Leicestershire" (illustrated).

June 16.—Paper by Mr. W. A. VICE, M.B.

The Paper for the evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

VOL. II.

PART IV., JULY, 1890.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 23RD, 1890.

LEICESTER:
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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

At the FIFTY-FIFTH ANNUAL GENERAL MEETING, held in the Lecture Hall, Town Museum, on Monday Evening, the 23rd day of June, 1890, at 7 o'clock.

J. D. PAUL, Esq., Retiring President in the Chair.

The CORRESPONDING SECRETARY presented the Annual Report of the Council, and the Financial Statement as Audited, which were taken as read.

Moved by Mr. G. STEVENSON, seconded by Mr. T. C. LEE :—

(1.) "That the Annual Report and Financial Statement be adopted, and printed for circulation."

Carried.

The CHAIRMAN, after a few remarks, vacated the chair in favour of F. T. MOTT, Esq., the New PRESIDENT, who addressed the meeting.

The PRESIDENT announced that as only a sufficient number of persons had been nominated to fill the several offices, no voting for any of the officers was required.

The PRESIDENT, therefore, declared all the gentlemen nominated duly elected, viz :—

Vice-Presidents :—

THOMAS CARTER, L.L.B.
E. F. COOPER, F.L.S.
J. D. PAUL, F.G.S.
GEORGE STEVENSON.

Council :—

C. J. BOND, F.R.C.S.
C. W. COOPER, M.B.
HERBERT ELLIS.
REV. P. T. FORSYTH, M.A.
R. HARVEY, L.L.B.
W. KEMPSON.
J. J. W. KNOWLES.
T. C. LEE,
M. L. LEWIS, M.A., LL.M.
F. M. POPE, M.B.
REV. T. A. PRESTON.
REV. J. WENT, M.A.

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Treasurer :—

ALFRED PAGET.

Hon. Secretaries :—

CORRESPONDING SECRETARY	C. J. BILLSON, M.A.
FINANCIAL SECRETARY	GEORGE HULL.
MINUTE SECRETARY	W. SIMPSON.

Moved by Mr. OLDERSHAW, seconded by Rev. P. T. FORSYTH :—

(2.) "That the thanks of the Society be given to the Hon. Secretaries and other officers of the Society for their services during the past year; to the representatives and proprietors of the Local Press for their reports of the Society's proceedings; and to the Curator for his services to the Museum."

Carried.

Moved by Mr. E. F. COOPER, seconded by Mr. J. J. W. Knowles :—

(3.) "That Mr. E. CLEPHAN and Mr. T. C. LEE be elected Auditors for the ensuing year."

Carried.

The Council afterwards elected Mr. A. P. MOORE, M.A., and Mr. A. T. DRAPER as Members of the Council, in the places of Mr. E. F. COOPER, F.L.S., and Mr. T. CARTER, L.L.B., elected Vice-Presidents.

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ON THE DEVELOPMENT OF MUSEUMS AS PUBLIC EDUCATORS.

By F. T. Mott. (Read before Section "D," *January 15, 1890*).

Museums, Free Libraries, and Art Galleries have this in common, that they are each expected to fulfil two purposes which are somewhat incongruous and require to be pursued by different methods and with different appliances. Each of these institutions is expected to minister to the wants both of trained students and of the untrained and ignorant public; and the demands of these two classes of persons are so diverse that they must be provided for separately. The Free Library must have its Lending Department for the general public and its Reference Department for students. The Art Gallery must have attractive and interesting pictures for ordinary visitors, but it must also have masterly studies for the instruction of young artists. The Museum, however, has a still more complex and difficult part to play. It has not only to provide for the diverse wants of students and of visitors, but it has also to contribute to the general progress of scientific knowledge. Every Museum, at least every provincial rate-supported Museum, which is a public and in some sense a national institution, has a *three*-fold duty: (1) to the nation at large, (2) to the students of the neighbourhood, and (3) to the local public. If Museums are ever to be more than a confused compound of the curiosity-shop and the peep-show, which is what very many of them are at present, this three-fold duty must be very clearly recognised and means must be found for the efficient carrying on of each department. It is no wonder that many persons doubt the real value of Museums, and that Free Libraries are regarded as much more worthy of support, while the splendid services which a provincial Museum might render are unrecognised even by the curators and governing committees. The curators are indeed beginning to bestir themselves, and if the public were sufficiently aroused to back them with reasonable funds I believe they are now prepared to make considerable efforts to put things on a right footing. The money required is not very serious in amount but nothing satisfactory can be done without it. A town of 150,000 inhabitants must provide an income of certainly not less than £1,500 a year for three or four years, and a permanent income afterwards of at least £1,000 a year, in order that its Museum may take its proper place as one of the most important and valuable of its educational institutions.

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The proper work of a Museum lies in three directions. Let us consider what can be done, and what ought to be done, in each of these, separately.

1. In its position as a National Institution, in what way can it contribute to the general progress of Science? The fabric of scientific knowledge is built up by the continuous accumulation of facts contributed by a vast army of observers scattered all over the world. The forces of this great army are at present very imperfectly organized. A number of local Societies do something towards the collecting and arranging of individual observations, but what they do is mostly desultory and not well directed. There are also large central Societies in Metropolitan cities, but the connection between them and local observers is extremely loose and irregular. There is at present, in this country at all events, no efficient organisation for building the Temple of Science in a scientific manner. If such an organisation is ever framed the local Museums will be the most important links in the chain. Every provincial Museum, which undertakes to do its proper work for the nation at large, must set itself to collect and record every natural fact in every branch of science within the area of its own special district. It must waste no energy upon anything outside of this district, but within it everything must be done as completely and as rapidly as possible. The Museum must be a scientific *Monograph* of the district, illustrated by actual specimens of the natural and artificial products of the district. If the local Societies in each branch of science could undertake the necessary investigations and collections on behalf of the Museum, bringing to it as to a general focus all the results of their work, the organisation might be tolerably complete and the public purse would be spared. But local Societies in their present form are quite unequal to such work as is required, and the only practical resource is for the Museum to engage a staff of investigators and recorders, and to have the whole district gone over systematically and repeatedly. The knowledge required is not only of the present aspect of nature, but of the past history of the earth itself, and of all the life which has been upon it within that special area. If every district in the Kingdom were thus worked up many scientific problems which are now insoluble would become plain, and the local Museums are the Institutions most capable of accomplishing this important object.

2. In its relation to the students of the neighbourhood, how can the local Museum render them the most efficient service? The help which can be given to students consists chiefly of teaching by experts, of books and objects for illustrating that teaching, and of facilities for individual experiment and research. The Museum should be the centre of scientific teaching in all branches. It should have a library of reference of not less than 500 volumes, a well appointed laboratory, a lecture theatre, and cabinets of specimens arranged especially for teaching purposes; and it should either be itself a College of Science, with professors attached to it, or it should be in such contact with all science teachers in the town that they would make use in turn of the rooms and appliances provided there.

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For this purpose the building must be in a central position, readily accessible. The whole contents and resources of the Museum must be open to students under proper supervision; and for their use specimens, other than those of the locality, must be provided. These must not be collected at random, but carefully selected as typically representing species, genera, families, or orders which are not found in the locality.

3. Lastly, in its relation to the untrained public, what can the Museum do to afford interesting instruction, and to awaken the thirst for knowledge? For the purposes of general Science, and of Study, nearly all kinds of specimens are best kept in closed cabinets safe from light, from dust, and from parasites. But the general public can make very little use of specimens so kept, and for their benefit the Museum must exhibit some of its treasures under glass. The public pass through the rooms and galleries and can generally get no instruction except from what they see. There are no teachers, and they cannot handle or examine anything. The utmost attention, therefore, is required to put everything before them in such manner as to convey the *most meaning* with the *least effort* and in the *shortest time*. The selection, the mounting, the arrangement, and the labelling of the specimens, are the important points to be attended to. We have first to *interest* the visitors and then to feed their awakened curiosity. There is nothing that will so readily catch the eye as an object with which we are partially familiar, but not satiated. Having already some ideas about it, we are prepared and interested to know more. Local objects of natural history and geology, local antiquities and manufactures, generally stand in this relation to the minds of visitors, and as these are the objects which a local Museum is bound to collect, and in which, therefore, if it does its duty, it will be especially rich, they are the objects which should be made most prominent in the public display. Every one knows something about the common Banded Snail Shell, but very few know *much* about it, although there is, in fact, a great deal of very interesting knowledge to be got from it. Let us take this common Snail, *Helix nemoralis*, and consider how it should be treated in a provincial (say a Leicestershire) Museum.

Its place will be in the "Biological" Department. Biology is a much better name than Natural History, because it represents the great natural division of life, whereas Natural History is indefinite and not conterminous with nature's divisions. The Museum should lead the way in all improvements of nomenclature, and this department should be called "Biology—including all life, vegetable or animal." Within this department, and in the division of Invertebrate Animals will be, among others, the sub-kingdom "Mollusca."* If in this division the cases are arranged against the walls of the rooms or galleries, then on the flat wall, just above the cases, should be painted in letters from 4 to 8 inches high, according to the size of the Museum, the word "Mollusca," and in letters a little smaller, the explanation, "Soft-bodied Animals; as the Oyster,

* See Diagram.

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Slug, &c; known species, about 20,000." If the collection is large, this heading may have to be repeated in two or three places. On a line below this principal heading will be painted the names of the several classes of the Mollusca. One of these will have the heading "Gastropoda: (stomach-footed), creeping by means of a broad elastic foot covering the under side, shell mostly in one piece (univalve); known species, about 12,000." Below the line of classes will come the line of the orders, one of these in the Class Gastropoda being the order "Pulmonata: breathing by a lung instead of by gills; known species about 4,350." And below the line of orders will come the families, of which there are five, in the order Pulmonata, viz., Limnæidæ, Auriculidæ, Helicidæ, the Snails; Limacidæ, the Slugs; and Oncidiadæ, an aquatic group, not British. All this may be painted on the walls, each line in one colour: say, the sub-kingdom, blue; class, green; order, red; and family, black. If double-sloped table-cases are used, not placed against the wall, the synopsis of the sub-kingdom should be painted on an upright longitudinal board. Then we come to the arrangement within the glass cases. Suppose the cases to be 2-feet 6 deep from back to front. At a distance of 1-foot 6 from the front there should be fixed a wooden partition, $\frac{3}{4}$-inch thick and $1\frac{1}{2}$-inch high, with the top edge bevelled, running the whole length of the cases, and on the bevelled top should be printed the words "British Forms, found in Leicestershire," and repeated at short intervals. The front division will then be devoted to the illustration of local life, while the back division will contain forms from various parts of the world, not occurring in the locality. At the back of all will be the names of the genera. Among these will be the genus Helix, under the family heading of Helicidæ, and there will be about 16 out of the 27 British species to be illustrated in the local division. Some of these species are extremely small, scarcely larger than a large pin's-head, and will occupy but little space; some of them, however, are from 3 to 6 inches long, and several have shells from 1 to 2 inches in diameter, and are subject to extraordinary variations. To illustrate fully the local forms of this one genus Helix will require at least 6 feet in length of the front division of the case. There must be models in wax, glass, or other material, of the animals themselves, and of each important variety; models of them at different stages of their growth, with the real shells attached to them. They must be shown on bare ground, among herbage, creeping up trees, burrowing under stones, hybernating, and feeding on various substances. There must be models of their eggs, and drawings of their internal organs magnified. Examples of the best popular books upon the subject should be displayed in the case, and a list of more important works, to which students can refer. Also, a small map of the county, geologically coloured, and another showing the drainage areas, that the restricted distribution of some species may be studied and its causes traced. To each species will, of course, be appended a label in bold legible type, not too crowded, giving the name, with the locality and date of each specimen, or group of specimens, and pointing out any

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about 20,000

Sub

40

SILIA, 380

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B

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special characters of the species or variety. Among these will be the common Banded Snail, *Helix nemoralis*, which, from its size, and the great number of its varieties, will require at least 2 feet of space out of the 6 feet allotted to this genus.

Any visitor to the Museum passing by this case and seeing his old acquaintance the common Snail Shell thus elaborately displayed, would be pretty sure to pause a moment, at least, in order to notice the beauty and variety of the Shells, and to ascertain why there were so many of them, and why they were made so much of. Here is the Curator's opportunity. If he has done his work properly, it will be impossible for that visitor to go away without having acquired some interesting information.

A Museum, of which every department was set up in this manner, would have a very different aspect from anything to be seen among provincial Museums of the present day. It would cost 50 per cent. more than the present system, but its value would be ten times as great. But a provincial Museum, which squanders its exhibition space upon anything beyond its local collections, with their exotic addenda, upon large ornamental groups, and efforts to illustrate the whole sphere of Nature, can *never* be set up in this way, because it cannot have either the space or the money to do both. Committees may discuss the question whether they shall undertake both systems, but it is certain that, in any ordinary provincial town, if both are attempted, both will be done badly. The right principle is to take the one system which is practicable and is especially wanted, and to carry this out with the utmost completeness.

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NOTES OF MY OBSERVATIONS AT THE GREAT SALINA.

By Rev. A. L. Sparkes, M.A.; B.Sc. (Read before Section "E.")

A glance at a map of South America reveals a number of spots, of various sizes and forms, very unevenly distributed over the Continent and described as "Salinas." They are most numerous in the Argentine Republic, especially in its central and North Western Provinces, but they are not limited to these parts of the country, nor to the country itself, for a few of them are found in Paraguay, Uruguay, and Bolivia.

As a general rule they cover the central parts of large low plains, but there are small ones in the deep valleys between the Andes and the Mountain Spurs, which that range gives off, most of which have a direction nearly parallel to the Andes themselves, and are situated at no very great distance from the main chain. There are also several of considerable size, similarly situated, between the spurs and the main chain of the Aconquija Cordilleras.

It will, however, be observed that these Salinas are found in mountain districts, only in their deepest valleys and those from which there are no outflowing rivers; in short, in such valleys as are entirely surrounded by elevated ground: such, for example, are the Salinas of Atacama, in Bolivia, and the Salinas de Ambato on the western side of the Sierras of the same name.

A Salina is a large track of country of which the surface is covered with salt. It is usually almost as level and as horizontal as the ocean. If any depressions exist on the surface, they contain lakes of water saturated with salts. Any elevated spot from which the salt has been blown away by the wind, or carried to a lower level by the action of rain, consists of fine sand entirely free from pebbles, upon which very peculiar forms of vegetation grow.

The plural form of the word, namely, "Salinas," is usually applied by the native people to a single Salina. In some cases several small Salinas are found in close proximity. Two Salinas in the country are more than 200 miles in length, and it is not difficult to understand the origin of the plural form of their names, for it would be long before the various places, at which travellers struck them, were discovered to be parts of the same white desert.

The lakes upon some of the Salinas vary considerably in size at different seasons of the year. In the rainy season they overflow, and the water spreads over the flat plains surrounding them. In the dry season the heat of the sun and the dry atmosphere soon reduce them to their former limits. Over all the Salinas the atmosphere is remarkable for its dryness, except at, and immediately after, the Summer rains.

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From what has been said of the nature of the country surrounding the Salinas, we may expect that the Flora of the Northern and Southern sides will differ greatly if the Salina is a large one. As they are found only in places very much below the elevation of the surrounding country and completely enclosed, there is a downward slope in every direction towards them. On the Southern side the slope faces the direction of the sun in the ecliptic all the year round, and consequently the rays of heat and light meet this slope at a larger angle with the horizon, than they would meet a similarly situated and equal horizontal plane. The amount of heat and light is, therefore, greater all the year round than such a horizontal plane would receive. On the other hand, the Northern slope is turned away from the sun, and is placed at a disadvantage with a similiar horizontal plane. Moreover, the Southern slope escapes the full action of the cold winds, which in this hemisphere blow from the South, and receives an advantage from its position in the warm winds which come down from the tropics. The Northern slope is also at a disadvantage in both these respects. In the case of the large Salinas the slopes are very considerable, as will hereafter be shown, and the difference between the Floras of the Northern and Southern sides is very marked. Even the shrubs of the forest, as well as the annual plants, show a difference, and the creeping plants, as well as those which are parasitic, belong to different species. On the Southern side the Stephanotis creeps from 30 to 40 feet up the Algoroba and the Pacará, and the chief parasitic plant is a species of Mistletoe, which in winter covers trees of the order Leguminosæ with a lovely scarlet flower—on the Northern slope the waxy white of the Stephanotis fades to a dingy yellow, and the highest part of the plant is within reach of the hand. The principal parasite is a meagre species of Cactus, about the thickness of a penholder, which creeps along the branches of the larger trees. On the Southern side the flowers of the Air plant are sometimes ten inches long, on the Northern they are not more than half that length. The only creeper which grows better on the Northern than the Southern side is the Convolvulus, and the indescribable variety and beauty of some species of this plant would probably be considered by some to compensate for the defects of the Stephanotis; but there is this difference, the Convolvulus flowers only about six weeks in the year, the Stephanotis shows its bloom on the Southern slope for ten months.

Nor is the difference confined to the Vegetable Kingdom. Birds and Mammals show evidences of climatic differences. The Parrots of the Southern side are more gaudy in their appearance than their Northern friends, and the Urón of the South finds on the Southern side the prey of the Lobo on the Northern. The ubiquitous Puma prefers the Southern side, but the "Tiger" (*i.e.*, Jaguar) has never yet been known to step across the great Salina, which is now about to be described.

It has been stated that there are two Salinas which are much larger than any of the others. These are the Salina of Rioja, in the province of that name, and the province of San Luis, and the one which, for its

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vastly superior size, is dignified with the name of "Las Salinas Grandes," or the Great Salinas. This "Las Salinas Grandes" extends from the Southern extremity of the province of Córdoba across the province of Catamarca, and nearly across the province of Santiago del Estero. Its total length in these three provinces is 262 English miles;—its greatest width, which is at the North Eastern extremity, is 55 miles, and its average width 30 miles. The approximate area is 7,900 square miles, or about one-seventh of the area of England. It contains a lake in that section which lies in the province of Catamarca, which, in the dry season, is not more than four miles in length, by three in width; but in the rainy season its waters extend as far as the railway in the north, covering an area of forty miles by twenty.

This Salina is crossed by two lines of railway. The first from Córdoba to Tucuman, which may be traced on the map, and a second line from Córdoba to Chiliceto (not marked on the maps). It is by the track of the first of these railways that these notes on the Salina have been made.

The Córdoba and Tucuman, or Central Northern Railway, as it is usually called, crosses the "Salinas Grandes" between the stations called San José and Recreo. The appearance of miles of salt on a bright moonlight night is beautiful beyond description. The full moon appears to give much more light in this country than in England, and the whiteness of the salt seems to add to the intensity of its power. On a clear, but moonless, night, Alpha and Beta Centauri and the Southern Cross shine brilliantly, and the atmosphere is so clear, and the railway track so straight and level, that the signal lights can be seen distinctly at a distance of eight kilometres, or five English miles, and, at that distance, the difference between a green and a red light is quite unmistakable to a good eye.

At the same time, a railway journey across this Salina is not always unalloyed enjoyment. It is always somewhat monotonous, and sometimes very unpleasant indeed. Upon a windy day, when the atmosphere is dry, the salt, in a finely divided state, is carried about by the wind and the current of air caused by the motion of the train, and it finds its way through the smallest crevices of the carriages. It is not unfrequently the case that passengers suffer much pain by the irritating action of the salt upon the eyes and the respiratory organs.

But the salt is only an occasional foe. On a calm day it lies quite motionless in its bed. There is a far worse enemy to every one who crosses the Salina, but more especially to those who cross it in the night. This is a very small fly, who is remarkably skilful and energetic in the exercise of his abilities. It is no relative of the mosquito, who is always good enough to sing to advise his friends of his presence, but the fly in question moves about more quietly than the owl. It is too small to be debarred by curtains of mosquito net, and "he makes his exits and his entrances" through the meshes with the greatest facility. Small as he is, he is so well supplied with surgical instruments,

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that he has no difficulty in carrying on his operations through a sheet or covering of linen or woollen; and so expeditious is he in his operations, that before the eye can fall upon him, his task is complete, and he has gone to seek another subject. The bites of this enemy are irritating for many days, and upon some persons they remain visible for months. This insect alone, of all forms of life, appears to live and enjoy himself in the dust of the Great Salina.

When the train crosses the Salina by daylight, more particularly in the forenoon of a hot day, the mirage is very wonderful. At a distance the salt has the appearance of a boundless sheet of water. The train appears to be running into an ocean, in which the distant telegraph poles are reflected. This ocean retreats as the train approaches it, always appearing at the same distance in front. The apparent distance varies, according to circumstances; near noon it appears greatest, other conditions being the same. At the same moment it appears much further off to a person upon the engine than to one standing upon the line, and further to a person standing on the track than to one sitting upon it. So far as observations have extended the apparent distance seems to depend upon three circumstances:—

1. The quantity of vapour in the atmosphere.
2. The elevation of the sun.
3. The height of the eye above the ground.

It is somewhat unusual to see any living being upon the Salina, when crossing it in the train, except, occasionally, a fox or a wood pigeon, who is migrating from one side to the other, or an unfortunate butterfly who has lost his way. Butterflies are very rarely seen upon it, and the species are quite different on the Northern from those of the Southern edge. But on the 22nd of December, 1888, as the train arrived about midway between the edges of the Salina, it suddenly passed into a flock of white butterflies, all exactly alike in size and colour. They were quite as close together as the particles of snow in a heavy snow-storm, and above, and on all sides, there appeared to be no limit to their number. The flock extended along thirty kilometres of the railway, and the train passed out of the flock just as suddenly as it entered. During the remainder of the journey to Tucuman not another butterfly of the same species was seen.

On July 12, 1889, on the Northern edge of the Salina, every tree and shrub appeared to be covered with locusts, which the train, in passing, seemed to put in a very restless condition. Four days afterwards, this flock had crossed to the Southern side, a distance of more than forty miles, and its members were regaling themselves on the rich verdure of the Southern edge, leaving the trees and shrubs of the Northern side as bare of leaves as the English trees in winter—not a blade of green was visible. This flock passed over the city of Córdoba upon the 28th of September, and for half-an-hour the city appeared, from a distance, to be covered with a cloud of smoke. They had occupied seventy eight days in a journey of 176 miles, during which their progress had been reported

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by the officials of the railway almost daily, for they did not leave the track of the railway during this part of their journey. By subsequent enquiries it was found that the same, or a similar flock, left the province of Catamarca, on the North Eastern side, upon the 2nd of June, and took the direction of the Salina. If these flocks were identical, which appears to be highly probable from this and other evidences, this flock of locusts travelled more than 400 miles, occupying in its journey 109 days, performing the first half much more quickly than the second, because there was a deficiency of food for them between Catamarca and the Great Salina.

In order that the physical features of the Great Salina and its surroundings may be understood, it is necessary to record a few facts respecting the country itself. The city of Córdoba, from which the writer has always set out on his journeys across the Great Salina, is 562 miles North West of Buenos Ayres, and 258 from Rosario de Santa Fé. The city of Rosario is the nearest point of the River Parana to Córdoba. From the Parana the land rises very gradually, and Córdoba is 615 feet above the level of the river at that point. Between Buenos Ayres and Córdoba, not a mountain is visible, nor an elevated spot worthy of the name of a hillock. The land is a vast track of sand and pebbles, covered with a few inches of soil, formed by the decay of generations of shrubs and trees. The city of Córdoba itself is just as level; the streets appear, without any exception, to be quite horizontal, but the city is surrounded on all sides by a ridge of high ground about fifty feet high, through which no opening is visible, except for the ingress and egress of the River Primero, which makes a very circuitous course through the city. Some distance away, on the Western side, is the range of mountains known as the Sierras de Córdoba. This range is 400 miles long, and its highest peak 8,000 feet high.

In order to show the low level at which the Salina is situated, the height of the railway which crosses it, in the direction of Tucuman, will be given at various points. We may suppose that the constructors of the railway would select a track for their line to the Salina which would be as free as possible from heavy gradients, and that the highest points of the railway are the lowest points of high ground by which the Salina can be reached. These details will give us a section from Córdoba across the Salina, and for simplicity we will take the height of Córdoba as the zero, or starting point.

Leaving Córdoba, the line ascends the ridge before mentioned, and at the end of 10 kilometres it is 481 feet above the starting point. The rise continues evenly until kilometre 110 is reached. The elevation above Córdoba, at that point, is 1587 feet; this is the highest point of the line. From this point to the Salina it descends. The Salina begins at kilometre 170, and at that point the railway is 218 feet *below* Córdoba. From kilometre 200 to 260 the railway lies on the salt plain, and it is horizontal at a distance of 346 feet below the level of the city of Córdoba. Thus the Salina lies nearly 2,000 feet below the highest point of the

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ridge which surrounds it. After passing the Salina the ground again rises. At kilometre 318 the railway is on the level of Córdoba; and at kilometre 500 it is 1,230 feet above it. Thus the Great Salina and its surroundings would show a section from South to North, something like the line below.

A section drawn in any other direction across the Salina would be represented by a very similar line, even if the section did not pass through a range of mountains. The river on the North Eastern edge, called, at Santiago, the Dulce, from the sweetness of its waters, and the Saladillo, after it passes the Salina, fails to find an outlet to the sea, or to the Parana, but pours its waters into the inland sea, called the Mar Chiquita, or loses them by evaporation.

The slope on the Southern side of this Salina, between the kilometres 110 and 170, where the Salina begins, is about 1 in 100. On the Northern side it is about 1 in 170. The slopes will be seen to be very considerable and the difference in the Fauna and Flora will be readily accounted for by the facts already stated.

In passing along this line of railway, as on others in South America, the eye of a stranger could not fail to fall upon the many skeletons of animals which are to be seen along the sides of the track. These are the skeletons of animals which have been killed by the cowcatcher of the train; they are the skeletons of horses, bullocks, goats, and foxes—their bones bleached white—and the time occupied in the process of removing the flesh is a very short one, two or three days being generally sufficient for Nature's scavengers to complete their work. These scavengers never tire until their work is completed, but pursue it with unremitting energy during every minute of the daylight, and some of them by night too, until the very last vestige, which is moveable, is carried away. These useful scavengers are the Black Vulture, the Corancho Vulture, the Carrion Beetle, and the various species of Ants.

The Black Vulture is the first operator upon the carcase. Sometimes, when not even one of them is in sight, an accident happens and an animal is thrown by the engine and killed. In a few minutes fifty or more of these birds will be seen hovering over the body at a great height, and, when everything is clear for them, they descend and rest upon the carcase. In a short time all the muscular parts of the animal are devoured. Flocks of Corancho Vultures arrive next, but these are so much afraid of their black brethren that they will not venture to approach until the latter have retired. The Corancho consumes

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the internal organs. The next at hand is the Carrion Beetle who, after feeding, carries pieces away to his hole. It is very amusing to see this insect with his load. He treats it quite differently from the Ant. The Ant arranges his burdens so that the narrowest and lightest part of it will be upwards and forwards, and the length of his load is in the same direction as the length of his body, part of it being over his back. The Carrion Beetle is more systematic; he rolls his bundle up so as to make it as nearly round as possible and, when his path is smooth and level, he rolls it in front of him. By this plan a Carrion Beetle, though he has such a clumsy habit of walking, apparently on the tip of his toes, will carry a load eleven times his own weight.

The Ant is the last scavenger; he removes the small pieces which are attached to the bones and the small pieces of skin, which the others have left, and when he has played his part the bones are as white as if the carcase had been cremated.

On reaching the highest part of the railway, viz.. kilometre 110, we find a great difference in the appearance of the forest. Palm trees predominate for about two kilometres, and there are three species of them, but beyond this spot there are no others to be seen during the whole journey to the frontier of Bolivia.

Descending the slope from kilometre 110, attention is attracted by the large number of birds' nests on the tops of the telegraph poles, and in the low bushes of which the forest is composed. Those in the bushes are about the size of a bandbox, so are some of those on the telegraph poles. They are quite round, and consist externally of nothing but thorns. The other kinds found on the top of the poles are entirely of mud. These are the nests of the bird called by the natives the "Hornero," from Horno—an oven; Hornero, an oven builder. The thorny nests are very interesting on account of their peculiar structure. There are six species of birds which make these peculiar nests—all these species are of the same colour and the same shape—the smallest is about the size of the English wren, and not much unlike her, but a little lighter in colour and decorated with a bunch of feathers on the top of her head. The one next in size is about the size of a sparrow; the other four are step by step larger, and the largest about the size of a small dove.

Hawks and ground vermin are very much given to robbing nests in this country, but this thorny nest is proof against their ravages. The inside of the nest of the smallest of these birds is the shape of a glass chemical retort, the long tube which leads to the place where the eggs are deposited is slightly spiral, and all through its length there are projecting spires and thorns. It would be impossible even for a mouse to get in without damaging himself. The nests of the larger species are similar in their internal arrangements, but the nests themselves are quite round, and the entrance tube makes a complete circle, so that the eggs are exactly under the entrance. The following rough sketch will give

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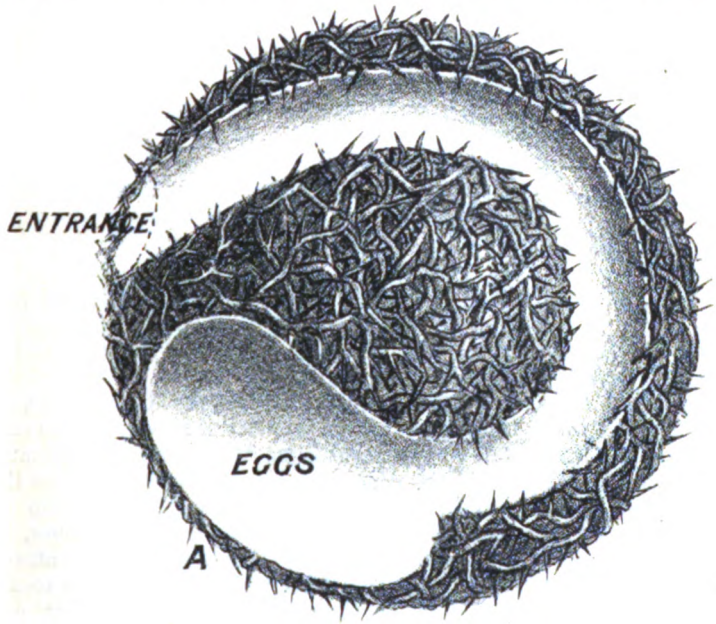
the idea of the arrangement. It shows how the tube would appear if the thorns were transparent on one side of the nest. There is no lining except in the part where the eggs are deposited, and the skins of snakes are frequently used for the purpose of lining these nests. When the young ones are ready to fly they are not permitted to go through the



tube, but the old pair take away the thorns at the spot marked A.

Another bird is closely associated in memory with these, because he steals the old sticks and feathers from these thorny nests and makes a nest for himself exactly underneath one of these. This bird is called the "Viuda," or widow bird. It is a white bird, about the size of a sparrow, with a black stripe upon each wing, and a little black on the end of its tail. There are two or three stories about the history of the name of this bird. Some people say that its name was given from its "mourning" on its wings; others say that it is so called because each bird lives a solitary life, except in the breeding season. Two are seldom seen in company at any other time of the year.

The other bird which builds its nest on the top of the telegraph poles is the "Hornero." His nest is made of mud. Externally it is elliptical in section, both horizontally and vertically, but it is divided into two

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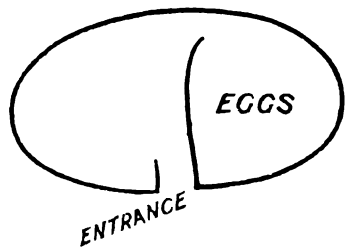
chambers. The diagram below will give an idea of its construction—it is a horizontal section through the centre of the nest.



The nest is about 10 inches long, from left to right; six inches high, and six broad.

The eggs are white—in fact, I have not yet heard of a South American bird, which makes a *completely* covered nest, whose eggs are not white, without spots or marks. At the same time there are many birds, whose nests are quite open, which have perfectly white eggs. The three species of doves, for example—one larger than the English wood-pigeon, another the size of the dove, and the third about as large as a thrush—all have white eggs; and it may be noted that their nests would compare unfavourably even with the English wood-pigeon, for the eggs can be counted through the bottom.

Connected in mind with the Hornero are the Campañeros, an interesting species of birds, because two pairs lay their eggs in the same nest and take turns in the work of incubation. One pair is always much smaller than the other pair—the difference being about the same as that of a sparrow and a thrush. Their eggs are often found in an old Hornero's nest, but in case the old nest is used by the Campañeros, the new occupiers remove the division on the right hand side of the entrance and so throw it all into one. All four of the birds are sometimes seen to fly out of the same nest, and on the contents being examined four eggs of each size have been found within.

On alighting at the Station of San José for the purpose of investigating the Southern edge of the Salina, the traveller will be interested in the Fireflies of this district, which are seen in thousands after sunset on a warm evening.

There are four kinds of Fireflies in this district. The largest, called by the natives the Mancito, has two lights on the thoracic segment, about midway between his eyes and the insertion of his wings. The light is constant and so bright, that if one of them is put under a glass tumbler the time of a watch can be read quite easily by the light, or if one of them is put upon a small book and the pages inclined to each other, both pages can be read. When they are seen flying in the orange groves, the oranges become visible as the Fly passes them, and vanish again in an instant, and the effect on the eyes is the impression that the oranges are in motion.

A second kind of Firefly is very much like an earwig in appearance, but has two stripes across the abdominal section, quite close to each other. These stripes are the light giving apparatus. His light is

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intermittent, and the time of shining is to the time of darkness in the proportion of 1 to 4. Examined under a microscope, when alive, it is observed that at the moment of becoming luminous a thin curtain immediately under the skin contracts by a muscular movement similar to that of the ciliary muscle of the eye. The light totally disappears in this species at the dark phase.

The third species has the light on the under side of the abdominal segment, and his light is intermittent; but in the dark phase the luminosity does not entirely disappear. There is no muscular curtain visible in this species, but the light appears and disappears as if by an internal pulsation. The ratio of the time of luminosity to that of comparative darkness is about 1 to 2, but the mechanism is clearly under the influence of the will, because, when he is pursued, his pulsations of luminosity become less frequent.

The fourth species is luminous on the abdominal segment at the posterior end, and the light intermittent; but the peculiarity of this species is, that for a few seconds after he has touched any object with the luminous spot, that object remains luminous.

So far as observations have been made here, there appears to be evidence of the following:—

1. If the luminosity arises from the thoracic segment, the light is constant.

2. If from the abdominal segment, the light is intermittent.

Mistakes are often made here in judging whether the light is intermittent or not, for nearly all appear to have intermittent lights at the time of flying, because the body intervenes between the observer and the light on account of the Fly moving from side to side in its flight.

A great variety of Beetles move about in the night. The most terrible of all these is the "Benchuca," which is probably one of the greatest enemies of man in this country. His bites are very painful, and a small number of them have the effect of disorganising the system, on account of the poison deposited in the wounds. The transformations of the Benchuca are peculiar, but at present observations are not completed. He appears to be a pale green Beetle, without wings before he reaches maturity.

Night in the forest is not so silent as might be expected. Even when the wind is not sufficiently strong to make the leaves rustle, there is no silence. The frogs emit the most discordant notes. One species makes a note like the sound of a small bell; another like the clapping together of two bones. There is a bird called the "Quinta Vé," which sings long after sunset, but his song is nothing more than a repetition of his name. An animal which roams about at night, called the "Biscacho," makes an unceasing sound like the mewing of a cat in distress, and if a fight occurs between him and his enemy, the "Uron," an animal of the ferret family, the sounds are simply excruciating. There are many owls, too, who indulge in screaming, and an insect, called by the natives the "Cicato," makes a sound like the whistle of a distant railway engine.

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San José is the railway station from which an explorer of the Southern slope to the Great Salina sets out. The distance to the Salina along the railway is eight miles from that station. The lake is 24 miles, and the nearest village to the lake is Toscas, about nine miles from it. This village is inhabited by Gauchos, not one European being there. The ride to Toscas is entirely through forest, but no difficulty is experienced in obtaining a guide. For some distance the ground is covered with long grass, and there are a few trees called the Chañares. These trees have a pale green bark and the wood is very hard; the natives make their bows of it. After travelling about five miles everything is different—no grass, but flowers, of almost every colour, more thickly together than the buttercups and daisies of England. The loveliest and the brightest of all is the scarlet verbena. Here, too, are numerous creeping plants—the convolvulus, the white stephanotis and many others. Green lizards and iguanas dart in all directions at the sound of the horse's footsteps. The Lizards are quite harmless, with the exception of a little brown one about as large as the English Triton. The natives have great dread of the bite of this reptile. He is usually seen peeping out of a hollow tree and he seldom ventures out to bask in the sun. The Iguana is harmless and the Indians account his flesh a great delicacy. Some of them in this region are four feet in length. The Urons roam about in search of the Conéje—a little animal like the guinea pig in shape but the colour of a rabbit—or the Biscacho. The Uron is a large ferret. The mode the Urons adopt to catch their prey is very clever. They usually travel in bands of five or seven; one of them, who appears to be the leader, walks to a hole and puts his head in. If there is nothing in it he walks away at once, followed by his companions. If it contains a biscacho or a coneje he walks round for some time, apparently to ascertain whether there are any more entrances to the same burrow; if so, his companions guard them, one going down each entrance and the rest standing quite still to listen. After some time those at the top make a sudden rush simultaneously to the holes and go in apparently to share the booty. They leave no chance of escape for their prey.

There are few species of birds except parrots, which are very numerous. Parrots and parroquets fly from almost every tree. The parroquet's nest is a very curious one: it hangs down from the outside branches of a tree and is the shape of a balloon with the narrow part upwards. The parroquet enters his nest at the bottom and it is very commonly the case that the same bundle of sticks is the abode of two pairs of parroquets, and in that case there are two holes near the bottom, one on each side, and the apartments of each family are not in any way connected. The large green parrot makes a nest precisely like an English magpie, partially covered at the top, and puts it at the top of the highest tree he can find. The brown parrot uses a hollow tree or a cleft in a rock. The Quinta Vé, which has been referred to before, uses nothing but feathers for the outside of her nest, but she lines the inside with flossy seeds such as

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those of the thistle, and as these seeds are not obtainable in the month she requires them, she prepares the nest a considerable time beforehand. The humming bird hangs its nest very often on a spine of the cactus, and the woodpecker appears to use the cactus only on account of the ease with which the soft cellular substance can be removed to make the hollow necessary for her nest.

There are three species of game birds in this forest—the perdice, or quail; the Monteracho, which corresponds with the partridge; and the martinette, which is nearly as large as a pheasant. They all make small nests on the ground, but they differ from English game birds in this, that they do not fly about in coveys, but are always found in the shooting season singly. The starling has all the habits of his English relative, but his coat is navy blue, without any spots. The blackbird has a representative here, who uses the same song as his English friend, but South American blackbirds have red breasts much brighter than the robin. The Cardinals are amongst the prettiest birds of this forest; there are two species—one has a bunch of scarlet feathers on his head, the other is scarlet from top to toe.

This region of the forest contains many magnificent trees and shrubs: the wild pepper, the nogal or walnut, the Algaroba, and the pacará. The shrubs *all* have either bipinnate or tripinnate leaves. One shrub has far more flowers upon it than leaves, and it is peculiar, inasmuch as it closes all its leaves at night. There is a very similar shrub in the Pass of Chumbicha, which closes its leaves when it begins to rain and opens them again as soon as the shower is over; but it will not close them nor show any sensitiveness at all when the leaves are touched.

Many of the trees are covered with cocoons of a moth or butterfly, but these are seen in many other parts of the country. In the very early Spring they fall off the trees and a large hairy caterpillar creeps out of them. There are four or five varieties of air plants growing on the trees, but no orchids South of the Salina. The flowers of the air plant are all white, and are amongst the few scented wild flowers of the country. Some of the spiders are immensely large, and the scorpion finds his home under the fallen trees.

On nearing the village of Tocas, the first view of the Great Salina is obtained. The lake is visible, and easily distinguished from the desert of salt which surrounds it. The water looks much darker than the salt. The ranchos of the natives are surrounded with fences of cactus; inside the fence are castor-oil trees, which afford a pleasant shade on account of the immense size of their leaves. Nearer to the dwellings are trees called in this country the Santioito, which are, to the taste of the writer, the most beautiful shrub in South America.

At the village all the accompaniments of Gancho life are to be found. The native is covered with his poncho; a horse stands saddled ready for use at every rancho. The women are pounding maize in a large hole in a large block of wood. The goats wait patiently to be milked. One store only in the village, at which all the luxuries of food and clothing

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for a Gancho can be obtained. Ask for butter and there is none; cheese, none; bread, none; but you can have "carne" (meat) or maize. But the Ganchos are hospitable if they are properly approached—bad as their character is represented to be; and the Gancho, who always keeps his horse saddled either for the use of himself or a friend who calls, only wants a hint to induce him to kill a kid and cook it for a stranger; and an appreciative expression, with satisfaction in his mind that a stranger is a friend, and not an enemy, will not fail to insure a traveller as many comforts as the Gancho finds necessary for his own life.

Round all the Gancho villages flies are plentiful, and the swallows find the secret out. The swallows of the South American summer are those of the North American. They collect, just as in England, at the end of the summer, and fly away in flocks to the other side of the Equator. They are much like the English swallows, but not quite the same; the swifts have tails less forked; they do not make the same whistle when they fly, nor do they make mud nests under the eaves of a building. Wasps are very numerous, and there are several species: one species attaches its nest under the eaves of houses, and many live together. Another species makes nests of mud inside houses. There are usually only two of these to a nest, and the nest consists of two cylindrical cavities attached side by side to a wall. The wasps do not go out of the room very often when the nest is finished, but they occupy themselves chiefly in seeking the spiders in the apartment. They appear to subsist entirely upon spiders and ants, and if the nest is pulled off as soon as the grub appears in it the skins of many of these insects will be found. The natives say that the wasp does not kill the spiders, except those he requires for his own use, but he stings the others to bring them to a torpid condition, and they live in a torpid state until the young wasp appears and requires them for food.

Ants are to be seen everywhere in South America, in fact, it would be difficult to find a square foot of ground without one or more upon it, but near the native villages, or on the banks of rivers, ant hills are to be seen two feet high, covering from twenty to thirty square yards. The Ants have tracks from the hills like sheep tracks, which ramify and get narrower as the distance from the hill increases. Before sunset all these tracks will be covered with the returning Ants, every one with his load. The time of their return appears to be limited to about two hours before sunset. A calculation, based upon a sound principle, was made a short time ago of the number of Ants in one of these ant hills, and it was found that the Ant population of that hill was not less than millions.

Leaving the village in the early morning, the ride to the lake is but a short one and the road is good. The reflection of the sun on the salt is somewhat oppressive. But the lake is soon reached. It is perfectly motionless, though it is clear it has been somewhat agitated recently, for the bank of salt on its edge is more than two feet high, and has the

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appearance of having been laid there in thin layers by the water overflowing and slowly evaporating. A bottle dipped in the water need only be laid down for a few minutes, and it will be impossible to say whether the glass is white or black, for the crystals of salt cover it completely. There is no sign of a plant anywhere near the lake, nor any sign of life in its waters. The mirage is visible over the salt, but not over the water, so the white expanse can be seen until the sky appears to descend to meet it. It is difficult to say, without a chemical analysis, of what this salt consists. No analysis of it has been made in this country. Crystals of nitrate of soda are plainly visible, and as the water is bitter, as well as saline, it probably contains iodides or bromides of the alkalies, or both, and, probably, salts of magnesia and calcium, as the water for domestic purposes on the edge of the Salina is very hard.

Not long ago the railway company bored 320 feet on the Salina itself, and at that great depth there was silver sand—nothing but sand after the salt had been passed.

About six miles north of the lake and all along the track of the railway there are sandy spots, upon which all the plants, now shown, grew. These are the only plants which grow in this desert, and they are different from any others found in the country.

The nature of the Salinas themselves, and the physical features of the surrounding country, might induce one to believe that at no very distant date these Salinas were the bottom of a sea connected with the South Atlantic, and the gigantic mountains of the Aconquija Cordileras were parts of an Archipelago. There appears to be some evidence that part of the Continent is still slowly rising. There is a process going on at the present time at the Mar Chiquita, somewhat the same as that which has formed the Salinas. The Saladillo has no outlet; the water of the Mar Chiquita is not yet as completely evaporated as that of the Salina; but all the physical features of the Mar Chiquita are similar to those of the Great Salina—it is far below the level of the surrounding country, and no outflowing river ever appears to have been connected with it.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

March 18, 1890.—Mr. G. P. HARPER, M.A., read a Paper on "Henry Thomas Buckle."

Mr. WM. SIMPSON was elected Chairman, and Mr. JOHN SCAMPTON was re-elected Secretary of the Section.

T. CARTER, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

March 14.—*Exhibition of Spring Flowers.*

About 25 species of wild and garden flowers were exhibited, including some of considerable interest, such as *Solanum jasminoides*, *Eupatorium rasbium*, *Forsythia*, *Azara*, *Leucojum vernum*, and the white variety of *Scilla bifolia.*

Paper, "On Micro-Fungi," by Mr. W. A. VICE; a careful description of the very remarkable life-history of these minute parasites, describing the development of the mycelium and the various forms of spores; the migration of the fungus from one host-plant to another; the destructive effect of the mycelium upon the tissues of the host; and the importance of a moist atmosphere to the development of these "blights," as the spores could not germinate in dry air.

A lively discussion followed the reading of this Paper.

April 16.—The CHAIRMAN reported that ten members and friends of the Section attended the Field-day Excursion on the previous Wednesday, and visited Buddon Wood and Mountsorrel Hill. Several interesting Fungi were collected, including *Dædalea unicolor.*

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Exhibition of Leaf-buds.—A large number of various species were brought together, and were very useful as illustrations of the Paper of the evening.

Paper, "On Vernation and Æstivation," by Rev. T. A. PRESTON, explaining the various modes in which leaves were folded up in the young buds, and the effects produced by the varied foldings on the form of the mature leaf. Sir John Lubbock and Professor Henslow had especially investigated this subject, and their reasoning appeared well founded. The very peculiar form of the leaf of the Tulip-tree could be explained by its curious position in the bud, and the constant pressures resulting from that position.

The Paper was illustrated by diagrams and models, and was followed by discussion and by examination of the various buds exhibited.

Rev. T. A. PRESTON drew the attention of the Section to the unusual severity of the recent night-frosts. In his garden at Thurcaston the thermometer on the grass had fallen to 20 degrees below freezing, and many others had noticed as much as 10 degrees.

The CHAIRMAN thought these frosts must have been of very brief duration, as scarcely anything had been injured in his garden at Birstal Hill, not even the young rose-shoots.

May 21.—Mr. CARTER reported that nine members visited Bardon Hill on the 14th, by the kind permission of Mr. EVERARD. The weather was showery, which prevented much rambling out of the pathways. A few Mosses were collected, and fine patches of the scarlet-fruited Lichen *(Cladonia pyxidata)*.

The CHAIRMAN reported that a party of 11 visited Belvoir Castle on the 8th, and were most kindly received and conducted round the gardens by Mr. INGRAM. Some of the Spring flowers were over, but the beauty of the Duchess's garden, the remarkable collection of hardy herbaceous plants, and the magnificent masses of Camellias and Tree-Rhododendrons in full flower in the open air were greatly admired.

Miss HOTTINGER reported that very little progress had yet been made in the botanical garden at the Abbey Park.

Exhibition of Caterpillars.—Too early a date had been fixed for this, and only three or four specimens were produced. The CHAIRMAN pointed out the fact that three species infested the gooseberry, of which one was green, one yellow, and one spotted. If one of these colours was supposed to be especially protective, the question naturally arose, why did not all three assume that colour?

Mr. E. F. COOPER exhibited a truss of Polyanthus bloom, on which was one yellow Cowslip flower; a curious instance of reversion, the Polyanthus being a cultivated descendant of the common Cowslip.

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Miss HOTTINGER exhibited some beautiful and interesting hardy flowers from the gardens at Birstall Holt, including *Dentaria bulbifera* and *pinnata*, *Adonis vernalis*, *Ulex hispanicus*, &c.

Paper.—"On the native Leguminosæ of Leicestershire," by Dr. C. W. COOPER; a description of the 48 species found in this county, out of the 77 occurring in the British Isles, with references to the localities in which the rarer forms are found. The paper was illustrated by a nearly complete set of dried specimens of the local species, from the Herbarium of Mr. E. F. COOPER.

F. T. MOTT, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

March 17.—The Chair was taken by Mr. E. PATTISON, in the absence of Dr. POPE.

A Paper was read by Mr. G. H. STORER, on "The American Beaver (*Castor canadensis*)."

In his opening remarks, Mr. STORER said that although it had never been his good fortune to see the Beaver in its native haunts, yet one of his friends—Mr. P. W. SPARKES—had only recently returned from America, where he had had many facilities for personally observing the habits of the animal, and consequently the Paper would principally consist of an account of his experiences during a somewhat extended sojourn in districts affected by them.

After some remarks on the general appearance and weight of the adult animal, Mr. STORER called attention to the curious supplementary claws found existing on the hind feet. After discussing their probable function, it was suggested whether they might have to do in some way with the operations of the Beaver when cleaning the fur. He then passed on to speak of the function of the large flattened tail, alluding to the obsolete idea which would credit it with being used for carrying, or moulding into shape, the mud used in building the lodge or dam.

An account was next given of a visit to a Beaver swamp, made by Mr. SPARKES in company with an Indian trapper. Mr. STORER drew a very vivid and life-like picture of an alder swamp, with the prostrate logs and pointed stumps showing the marks of the teeth of the clever architects, whose dwellings and habits of life were described in detail. The various methods of trapping Beaver—by damming up the entrance to the lodges, by traps and by the use of Castoreum—were also fully

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explained, the whole subject being handled throughout in a manner which secured the close attention and interest of all present, from first to last.

In the discussion which followed, Mr. PATTISON and Mr. PYCRAFT asked for some information as to the way in which the logs, when cut, were transported to the water if at some little distance therefrom. Other members also put questions relating to the dressing of the skins, &c.

Mr. STORER, in replying, said that the logs were conveyed to the water by rolling, or by cutting canals in which to float them down, a proceeding no doubt requiring the co-operation of several animals. He also described the preparation of Beaver tail as an article of diet, and the principal steps in the preparation of the skins for trade purposes.

A vote of thanks was then proposed by the CHAIRMAN, seconded by Mr. T. BROWN, and carried unanimously.

Exhibits.—Skulls of adult and young Beaver (two taken from old Indian "kitchen middens" on an Island, Heron Bay, N. America, and one of a kitten Beaver, trapped by Mr. SPARKES); also feet showing claws. By Mr. G. H. STORER.

Fossil Cephalopoda, Brachiopoda, &c. By Mr. A. E. BAKER.

April 14.—Mr. J. G. PARR, F.R.C.V.S.E., was unanimously elected an Associate of the Section, on the proposition of Dr. F. M. POPE, seconded by Mr. MONTAGU BROWNE.

Mr. SPARKES' promised Paper, on "The Great Salina," having come to hand, it was read for him by Mr. MONTAGU BROWNE.

The Paper consisted mainly of a description of the features which characterize the S. American Salt Plains, or Salinas, and of the animal and vegetable life found on them and in their vicinity. Mr. SPARKES' familiarity with these interesting spots ensured the interest of the notes which dealt with his personal experiences, an added value being given to the facts stated by the exhibition of a number of specimens collected by him during his travels, many of which were of great interest.

A vote of thanks was unanimously accorded to Mr. SPARKES on the proposition of the CHAIRMAN, and the SECRETARY was instructed to notify the same to him.

Mr. BROWNE then proposed that the Paper be printed in the Quarterly Transactions, as it contained many geological and other problems of interest. This resolution was also carried. (See page 12.)

May 19.—The SECRETARY presented the Annual Report and Balance Sheet, both of which proved the Section to be in an eminently satisfactory position. They were duly passed by the Meeting.

The election of Officers next took place, the present Chairman and Secretary being re-elected.

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Mr. J. D. PAUL then suggested the advisability of electing a Vice-Chairman, who might occupy the Chair at such meetings as the Chairman might be prevented from attending. After some discussion, this proposition was referred to the next meeting for consideration.

Mr. A. E. BAKER brought forward a resolution to the effect that abstracts of the proceedings of each meeting be forwarded to the local papers for publication.—Carried.

Mr. C. FOX STRANGWAYS, F.G.S., &c., of H.M. Geological Survey, was unanimously elected a Member of the Section (through Mr. MONTAGU BROWNE).

Mr. MONTAGU BROWNE, F.Z.S., F.G.S., &c., then read a Paper entitled "A Supplementary Contribution to the History of the Fossil Fishes of the Rhætics of Leicestershire," which formed a valuable addition to local palichthyology.

He prefaced his remarks by calling attention to the fact that the fish remains described by Mr. A. S. WOODWARD, of the British Museum, in the Society's Transactions for April, 1889, which were credited to Mr. H. E. QUILTER, really formed part of the BAKER collection. Since that time, however, Mr. BAKER had placed the remainder of his collection, containing many hundred specimens, in his (the lecturer's) hands for identification and description, with the result that many forms of great interest had been brought to light.

Chief amongst these, perhaps, was the discovery of the true value which should be attached to a fish-tooth which was first described by Mr. J. W. DAVIS, F.G.S., from a specimen found in the bone-bed at Aust Cliff, near Bristol, and named by him *Ctenoptychius ordii*, and of which he (Mr. DAVIS) gave an elaborate description and figure in the Quarterly Journal of the Geological Society, 1881, pp. 422-4.

In looking through the BAKER collection, Mr. BROWNE came upon a fragment agreeing in every respect with the fossil found by DAVIS. Being unable, however, to accept DAVIS's theory respecting the tooth, he made an independent examination, with the result that it is probable that the so-called *Ctenoptychius ordii*, DAVIS will prove to be nothing more than the worn base of a tooth of a well-known Triassic Shark *(Hybodus minor)*. In this case he would be able to demonstrate that DAVIS had erroneously figured such a specimen upside down, and had, in consequence, described it as a tooth of quite a different character.

Other interesting finds comprised a perfect example of a head-spine —"*Sphenonchus*"—which Mr. BROWNE was inclined to think would ultimately have to be regarded as belonging to *Hybodus minor*—and interesting as being a new record for Leicestershire, and some magnificent examples of fin-spines of Sharks which had been re-constructed from scattered fragments with an expenditure of much time and skill, and some of which were probably referable to *Hybodus cloacinus*. These Mr. BROWNE described in detail, and his remarks were listened to with much interest.

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In addition to the above, fine series of teeth of *Hybodus minor* and *cloacinus*, *Acrodus minimus* and *Saurichthys acuminatus*, and scales of *Gyrolepis albertii* were shown; also examples of the so-called teeth of *Sargodon tomicus*, which, the lecturer said, wonderfully resembled shed tubercles from the fin-spines of a Triassic Shark, *Nemacanthus monilifer* (= *Hybodus minor*), spines of which were also exhibited.

The Paper was illustrated throughout by a number of beautiful specimens of the forms described, and by blackboard illustrations.

Mr. J. D. PAUL, F.G.S., proposed a vote of thanks, in which he characterized the Paper as a very important contribution to the history of the Rhætic beds. In referring to *Ctenoptychius*, he called attention to the sharpening of the base of the *Hybodus* tooth, which was hardly to be expected as having taken place by attrition. He also rejoiced that the credit of Mr. BAKER'S work had arrived at his own door, as it was of first importance that credit should be given to whom it was due.

Mr. A. E. BAKER—who had collected all the specimens in question—seconded the vote, which was supported by the CHAIRMAN, who asked whether *Hybodus* could have possessed more than two dorsal fins, and thus form a link between Elasmobranch and Ganoid Fishes?

Mr. BROWNE, in replying, said that such might perhaps have been the case in some genera, but the evidence as yet collected did not tend in that direction, and although the question of fin-spines was a very intricate one, *Hybodus* had better, for the present, be credited with *two* dorsal fins.

At the close of the Paper, Mr. E. PATTISON exhibited specimens of *Planorbis corneus* and *P. complanatus*, from backwaters near Aylestone, a new locality for the first-named species.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. WILLIAM SIMPSON, 1, Brighton Villas.
Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

No Meetings are held during the Summer months.

WILLIAM SIMPSON, *Chairman.*

SECTION "D."

Chairman—Mr. F. T. MOTT, Birstal Hill, Leicester.
Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

FIELD DAYS—The second Wednesday in each Summer month, at about 3 p.m.
EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

F. T. MOTT, *Chairman.*

SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.
Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1890.
July 7.—Exhibition of specimens of Natural History and Ethnology from South America, with Notes thereon, by the Rev. A. L. SPARKES, M.A., B.Sc., who will be present.

August.—No. Meeting.

September 1.—Notes and exhibits by various members.

The Paper for the evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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TRANSACTIONS

OF THE

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NEW QUARTERLY SERIES.

VOL. II.

PART V., OCTOBER, 1890.

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E. ZOOLOGY, (With which is amalgamated Section **C.** GEOLOGY).

Chairman, F. M. POPE, M.B.
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Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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ON THE TEACHING OF BOTANY.

By Miss Hottinger. (Read before Section "D.")

Botany is a study so vast that to attain to anything approaching a complete mastery of it requires the labour of a life-time. It is necessary, therefore, in order that young students may not be disheartened at the outset, to begin by cultivating the true love of nature, the power of accurate observation, and the faculties of patience and perseverance.

The true love of nature! Many fancy they love flowers because they like to adorn themselves, their tables, their rooms, with them; many like flowers so desperately that they lay hand on all they can get, root and all, and return from a walk laden with flowers, never to be looked at again, never to be treasured in vase or herbarium, but left to die. A true lover of flowers loves them for their own sake, loves to see plants grow, develop, bloom, and produce fruit; gathers them only to lengthen as much as possible the time of watching their loveliness, of impressing their special features on his mind, of comparing them with others, of increasing his own and others' knowledge by one clear, solid, new fact from among the innumerable wonders of inexhaustible nature.

The power of observation! How many people waste this precious gift in observing what is of no consequence, no value in the formation of character, or the acquisition of knowledge. It is natural to children to observe. If guided wisely and judiciously they can be led early to observe and love all that grows near them. They can be taught the names of all the trees, shrubs, and flowers of field and garden. They will have pleasure in laying the flower of a Dead-nettle near a Violet, or a Lime-leaf near a Sycamore-leaf, comparing the two and expressing the resemblance and difference as well as they can in their own words. If they cannot find words, the teacher will supply them and thus gradually enlarge their vocabulary and their power of observation and description. Even with children of an older growth—with botanical students of any age—it seems to me that the first step ought to be to teach them the names and make them notice the most striking features of the plants they see around them in gardens, avenues, parks, or greenhouses, as well as along the hedges, in the fields and woods, near brooks and ponds and rivers.

Thus, my notion of teaching botany to beginners would be to have a small class with which I could take frequent walks, looking up to the trees in winter and summer, watching the ground to see what had fallen from the trees—seeds of the elm, catkins of poplars, bark from planes, etc., etc.

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I have noticed many cases in which the desire for acquaintance with the wonders of the vegetable world was stifled by the first instruction offered, which began at the wrong end, presupposing a vast amount of philology and physiology and entering into too many details which only a well-practised eye could possibly distinguish.

In botany, as in many other things, I would say—Leave it to nature, to natural instruction, to observation, guided by judicious tact; progress only gradually towards systematic arrangement and description in scientific terms; induce the pupils to observe every plant that comes within their reach—not merely wild flowers, which all cannot obtain easily at all times.

In a school I should wish an hour a week set apart all the year through for teaching botany to children of the ages from ten to twelve. I should wish them to bring specimens every lesson, whole plants with roots and flowers being the most acceptable; but I should welcome everything—leaves, buds, blades of grass, onions, French beans, potatoes with large eyes, chestnuts, anything gathered from the plant or picked up from the ground. If we had merely poplar leaves we could learn why they tremble more than other leaves. We should soon observe the various positions of leaves on the stems, count the number of leaves situate in one spiral line, and notice the various kinds of inflorescence. In the winter the evergreens would provide us with a large field of observation. Pupils could tell me which trees retain their seeds, how many plane-trees with globes of seeds dangling by their long stalks they had observed, how the hoar-frost had settled on the various leaves, stalks, and blades of grass.

Thus, by the end of two years, in the case of a class of children, or after a year's observation on the part of an adult, much valuable material would be collected with which to build up the edifice termed Systematic Botany.

Then I should lead up to the consciousness that some order must be put into that mass of observation. One morning I should write on the blackboard two headings: "Plants with parallel veined leaves" and "Plants with branched and netted veins." The pupils would mention plants of each division to be written down under the two headings. Two other headings would be, "With one seed-lobe" and "With two." We would compare these two lists and see that the dicotyledonous plants all have reticulated veins, the monocotyledonous parallel ones. We should have to wait a little longer to prove that the endogens and exogens correspond with these two great divisions, and still longer before they could take it in as a fact that there is a third, great, immensely-spread division of Acotyledons.

Some of my headings would be: "Sepals united; sepals separate." "Petals united; petals separate." "Regular and symmetrical flowers." "Tube-shaped flowers, salver-shaped, wheel-shaped," etc., etc. The uses to which the various plants are put would offer amusing natural divisions —plants of which we eat, or otherwise use, the root, underground stem,

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stalk, leaves, flowers, involucre, stigmas, fruit. Again, subdivisions as to the part of the fruit which is useful or ornamental. Such wanderings would lead us from the carrot to the stigmas of the saffron and the silvery partition of the silicule of Honesty. As we go on, these lists would gradually become more scientific and more complete, and in time we should have full tables representing the varieties occurring in all the parts of the plant.

I should also induce pupils to keep a calendar as to what is to be seen each month in the way of flowers, leaves, fruit, and should make them look for the flowers of the yew, cypress, juniper, box, and elm, of the existence of which many people are quite ignorant, fancying that flowers are only things which have bright and striking petals. To make their calendar very full they might also look at the fruit-stalls and thus early enlarge the range of their ideas beyond the boundaries of the very limited capacity of our climate. Just as gradually as the want of arranging our observations made itself felt, I should write on my black-board, "Flowers with two stamens, with three, with four of the same size, with five with free anthers and free filaments," etc., and should just allow the dear old most naturally-developed Linnæan system to steal into their unsophisticated minds. Children early like to count, and it would give them infinite pleasure to record the number and peculiarity of stamens. If there were room for the twenty-four headings in our schoolroom they could be hung on the walls; if not, they could be written down in books, plenty of space being left to add examples to each class as specimens are found. It is true the vast division of the cryptogams would be but unworthily represented; but then, in writing down mosses, ferns, fungi, etc., I should say most emphatically, "that is a realm too vast and too minute to be explored by children; but perhaps a time may come when one of you may be a specialist in ferns, another in lichens, another an authority on seaweeds." The greatest fault to be avoided in all teaching is always the fancy that what is being learnt is final; each new bit of information must be felt as a stepping-stone to new knowledge. In Botany we can continually point to something higher to be learnt yet, and whilst at the beginning we must limit ourselves to the larger features and to what the eye can easily find and examine, we can every now and then hint at the marvellous development going on within the structures, which only later study and plenty of leisure will allow us to fathom.

If two years of such unlimited observation were passed it would not matter much what the next step would be. One might begin by lecturing on the various kinds of roots, underground stems, stems, leaves, inflorescence, flowers, nectaries, fruits, showing as many specimens as possible, and many diagrams, and always referring to the stock of information gathered by observation. Then again the teacher would procure a certain plant—a specimen for each pupil—to be accurately described in systematic order—to save time, always in the same order—beginning with the root and ending with the pistil and fruit. A most

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useful way of impressing the characteristics of two families would be to have two distinct plants under observation—*e.g.*, a buttercup and an apple-blossom. After the two were described, the resemblance and difference being clearly seen, the pupil would be quite sure as to the respective characters of the Ranunculaceæ and the Rosaceæ.

I need not say that Etymology must go hand in hand with Descriptive Botany; each word new to the learner must be accompanied by very thorough exercises in the use and meaning of each syllable. Thus, for every *epi* and every *hypo*, every *poly* and every *peri*, every *syn* and every *ex*, I should make the pupils bring up from their store words with the same syllables occurring in other departments, so as to make them thoroughly realize the meanings of words. If this is done, and if Etymology and Botany are made additionally attractive by proving that scarcely a new discovery is made, scarcely a new remedy or a new fashion introduced, without the help of some of those words which frighten beginners in Botany when they hear them in the aggregate, surely, minds of the most varied constitutions will be interested.

An ingenious and painstaking teacher will introduce variety into his lessons, now doing all by word of mouth, now making the pupils write short descriptions on pre-arranged sheets with printed or clearly-written headings, now requiring full descriptions. In dissecting flowers children can be taught to be accurate by having to place sepals, petals, stamens, pistils on cards, containing these headings and blank spaces left for the objects themselves, and for drawings of the same.

Valuable books have been published lately for the use of older students. In all cases, however, the bookwork must be tested by the personal observation of the student. With a set of botanical tables, a knife, a magnifying glass, the student should dissect and accurately describe every plant on which he can lay his hands. By continually comparing plants he will not fail gradually to master the natural order of classification and to fit himself to identify plants which are quite new to him.

After thorough knowledge of Descriptive Botany has been obtained, the minute structure of the tissues should be studied. For this plenty of diagrams are necessary, and when possible a microscope, by means of which the elder students could examine slides prepared by themselves. This adds greatly to the interest of the learner who is made to rely upon his own observation and accurate work.

When the structure of the plant is understood the uses of the various organs can be explained. Here again every possible experiment that can be made adds to the interest and delight of the study.

The diligent student will now be prepared to enter the wide field of Grasses and of Acotyledons, where all his love of nature, power of most minute observation, patience and perseverance will be amply rewarded.

A Paper on the teaching of Botany would be too incomplete without any mention of the great value of herbariums. In my ideal small class, or in the case of children taught by a governess in an ideal flowery

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country place, a collection of dried plants would be a natural development of botanical studies; but in the case of town children it must be left to voluntary effort, to holiday times, and to later years.

Henslow's botanical diagrams will be found of great assistance for the teaching of the natural orders to large classes. There are ten large sheets containing types of twenty-nine of the principal orders, a picture of the whole plant (natural size), representations of the various parts on a magnified scale, and transverse and longitudinal sections of fruits.

Kny, of Berlin, has published twenty large tables, illustrating cell formation, stomata, hairs, development of embryos, crystals occurring in plants, all on a very large scale, magnified from 1,000 to 3,000 times.

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ON VERNATION AND ÆSTIVATION.*

By the Rev. T. A. PRESTON, M.A. (Read before Section "D").

VERNATION is defined to be "the manner in which the rudimentary leaves are folded up in the buds of different plants"; Æstivation is the corresponding term applied to "the arrangement of the floral envelopes in the bud." Until recently, it was merely deemed sufficient to cut a bud across, draw a diagram of the transverse sections of the leaves, as they presented themselves, and, if different from any previously known arrangement, give it a hard name and think no more about it.

I trust that in the following paper, I shall do without many of these hard names; my remarks will certainly not be exhaustive, but merely tending to indicate how a study of these buds may be interesting, as well as how much has yet to be learnt on the subject.

Both Vernation and Æstivation will be taken together; for the parts of a flower are only modified leaves, and the same type may exist in both, though disguised by different names. By the plan I have adopted, I hope to make one explain the other.

The methods of arrangement of the leaves in the bud may be classed under three heads: (1) where the edges of the leaves, or some of them, overlap their neighbours *(imbricate)*; (2) where they just meet, but do not overlap *(valvate)*; and (3) where they are so slightly developed as not to touch one another at all, often appearing but as teeth, as in the calyx of *Umbelliferæ*, when the name "open" is applied to the Æstivation by Henslow.

The usual number of parts in a whorl in Dicotyledons is five, and in Monocotyledons three. This is, of course, far from universal, but it will probably be found that this five-leaved type will prove to be the origin of all the others, for even the three-leaved may be derived from it. The five-leaved type will, therefore, be taken as the basis.

An ordinary leaf bud developes into a branch, on which the leaves are arranged according to a definite plan; it will be evident, therefore, that the arrangement of those leaves will be traceable in the bud. It has, indeed, been stated that "leaf arrangement exists for, and is determined, in the bud." I certainly do not hold to this opinion; it seems

*In the following Paper free use has been made of the following monographs. I have purposely done so, in order to bring them before the notice of the Section:—

Rev. G. Henslow "On the Origin of the prevailing Systems of Phyllo-taxis," *Trans. Linn. Soc.*, second series, vol. i., p. 42; "On Floral Æstivations," ditto, vol. i., p. 177; "On Vernation and the Methods of Development of Foliage, as Protective against Radiation," *Journ. Linn. Soc.*, xxi., p. 624.

Sir J. Lubbock "On the Forms of Seedlings and the Causes to which they are due," *Journ. Linn. Soc.*, xxiv., p. 62; "On the Shape of the Oak Leaf, and on the Leaves of Viburnum," *Journ. Bot.*, April, 1885, p. 125.

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to me that the arrangement in the bud has been formed in accordance with the future development of the branch.

Now the most common arrangement of the leaves on the stem of Dicotyledons is what is known as the $\frac{2}{5}$ (or *quincuncial*); *i.e.* if we trace a line on the stem from node to node, by the time it has reached the 6th node from starting, (which will be the next one exactly over the 1st) it will have gone twice round the stem. Thus the numerator of the fraction expresses the number of *turns*, the denominator the number of *leaves* in a spiral. As the spiral has gone twice round the stem, the angular distance described is $2 \times 360° = 720°$; dividing this by five, the number of leaves in the spiral, we get 144° as the angular distance between any two consecutive leaves. This angle is very constant in the five-leaved arrangement, and it will be well to bear it in mind in order to obtain the proper sequence of the parts in any whorl, especially of the flower.

If we were to place a branch with five leaves, quincuncially arranged, upright, and to imagine the leaves pushed down vertically so as to assume the positions they would have were they the leaves of a flower, we should find that they would have arranged themselves as the petals of the Buttercup; *i.e.* two wholly outside, two wholly inside, and the fifth overlapping; and if we numbered these petals in the order in which they appeared on the stem, they would be as in fig 1., which represents them as in the bud. As the angular distance between the points of insertion of any two consecutive leaves must be 144°, it will be seen that the spiral goes from left to right; but it is easy to see that the leaves might have been arranged so that the spiral should go from right to left; the spiral will, therefore, be left-handed in one case and right-handed in the other. There is, however, considerable confusion among authors on this point, some saying that we ought to look at the branch or flower from the outside, others that we should consider the eye placed in the centre, as we really do, when we look at a diagram; but this change of the position of the eye will cause the appearance of the spiral to be different. It will be well, therefore, to avoid these terms, and merely say, when necessary, that the spirals go in opposite directions.

The $\frac{2}{5}$ arrangement will be taken as the fundamental one, and from it several modifications arise. Thus, if we merely put the edge of (4) outside, instead of inside, (2), we get the *half-imbricate* æstivation (fig 2); if we *also* put the edge of (5) outside (3), we get the *imbricate-proper* (fig. 3); and if the edge of (3) outside (1), we get the *convolute* (fig. 4). The petals of this last are supposed to be perfectly straight, but if they are twisted (as in Mallow), we should have the same diagram, but the æstivation would then be said to be *contorted*.

By this very simple method (produced naturally by a little quicker growth on one side of a leaf than the other) we see how four different kinds of æstivation are derived directly from the $\frac{2}{5}$ arrangement. But it is remarkable how very common this same arrangement occurs in irregular flowers. Take the *Pea*, for instance, the type of *Leguminosæ* (fig. 5); the æstivation is precisely the same as the half-imbricate, the standard

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being (1), the keel composed of (2) and (5), and the two wings of (3) and (4). Take next the *Cassia* (fig. 6), of the same natural order, but of the sub-family *Cæsalpineæ*, and which has the wings inside, instead of outside, the keel. Its æstivation is precisely the same as the half-imbricate only in this case the standard is (5), the keel composed of (1) and (4), and the two wings of (2) and (3). It may be objected that the standard in these two flowers is formed from two different petals, apparently quite altering the character of the flower. But this is no real objection, as it will be found that a similar *shifting*, as I may call it, of the petals is extremely common, and the resemblance between the two flowers is often more apparent than real.

In *Polygala* (fig. 7), again, irregular as the flower is, it will be seen that its æstivation is that of the $\frac{2}{5}$ arrangement. In *Antirrhinum* (fig 8), the lower lip is (5), the upper formed of (1) and (4) and the æstivation half-imbricate.

Thus, by considering each petal as itself capable of varying in size, we still keep the same æstivation, only having to shift the diagram to make what appear to be corresponding parts assume corresponding positions. One difficulty may suggest itself; viz., that in the flowers selected there is a bi-lateral symmetry, *i.e.* they can be cut vertically into two similar and equal portions, right and left; but by referring to figs. 1 and 2, it will be seen that flowers formed on the $\frac{2}{5}$ and half-imbricate plan can be thus equally divided, and hence the "objection" really tends to confirm the correctness of the suggested interpretation of the structure.

By the suppression of (1) in the half-imbricate æstivation we get the regular four-leaved and by suppression of two parts in the imbricate we get the important three-leaved æstivation (fig. 9), so very common among Monocotyledons. But we must not suppose that either the four-leaved or three-leaved æstivation is in all cases similarly derived: this will be better seen when we examine a few individual cases.

In the two-leaved æstivation we have two forms, the *equitant* and the *half-equitant*, according as the edges of one leaf are both inside those of the other, or one inside and one outside. Both these forms can be derived from the three-leaved æstivation by the suppression of (1) or (2).

To take now a few examples:

First, *Papaver* (fig. 10). In the ordinary form of the flower there are two sepals and four petals, the former half-equitant, the latter equitant. As this is a Dicotyledonous plant we should expect that the æstivation would be derived from the $\frac{2}{5}$ arrangement, by the suppression of one petal and three sepals; Henslow is, however, inclined to derive it from the three-leaved type—that there are two whorls of two petals each, not one of four petals, and that one part is suppressed in each whorl; this opinion is somewhat confirmed by the fact that a third sepal is sometimes developed in *Papaver orientale*.

In *Circæa* (fig. 11) there are two sepals and two petals, both half-equitant. The æstivation in this case may be derived from opposite leaves (which Henslow considers to be the primary arrangement from

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which all other forms of Leaf-arrangement are derived) or reduced from a four-leaved type, which prevails in the Natural Order *Onagraceæ* to which *Circæa* belongs.

Actæa, *Adoxa*, and *Cruciferæ* may be derived from the $\frac{2}{5}$ arrangement by the suppression of (1) or (5).

In the *Valvate Æstivation* the edges merely touch but do not overlap. Sometimes the edges are rolled inwards or outwards, when we get the *conduplicate* and *reduplicate* forms; these will be alluded to later on.

On *Open Æstivation* I have no remarks to make.

Vernation and Æstivation doubtless furnish important characters, and in some Orders æstivation is remarkably constant, but in others it is as remarkably the reverse. In *Primula vulgaris* alone there are no less than eight forms, whilst in *Galanthus nivalis* in 24 buds there were found by Henslow as many as 14 different ways of arrangement. These characters cannot, therefore, be used for classification, except in a very limited degree; in fact it is really remarkable how little they can be so used. The Laws of Leaf-arrangement, again, apply in certain cases to the floral whorls, especially the $\frac{2}{5}$ arrangement, but though the $\frac{3}{8}$, $\frac{5}{13}$, and even the $\frac{8}{21}$ may sometimes be detected; yet even here the spirals of two consecutive whorls may be in opposite directions.

It will be observed, again, that the *numerical order* of the parts in each whorl is very variable, and this occurs even in the same species. And as for the *order of development* of the whorls, the variation is equally remarkable. The calyx is always developed first, and the corolla last, as far as I am able to discover; but of the other parts, sometimes the stamens are formed first, sometimes the pistil; or one whorl of stamens before another; or even one whorl intercalated between two others primarily formed. Sometimes the order of growth is disguised, one whorl being very much smaller than another at first, but ultimately far exceeding it; in *Stellaria Holostea*, for instance, the petals are at first much smaller than the stamens, but, as is well known, when the bud opens they are far larger.

Such variations render the subject very complicated, and much has yet to be learnt; still, what has been done has served to simplify the matter, and possibly laws, hitherto undreamt of, may enable us to explain what at present is certainly perplexing.

But I must hurry on. We have seen how vernation is necessarily connected with the *arrangement* of the leaves on the stem. It is also connected with the *form* of the leaf. The bud is, in many cases, protected by a series of scales, which do not usually grow, but are ultimately pushed off. But until they are so removed, they will constantly exert an ever-increasing pressure on the young leaves as they are being formed in the bud. These leaves originate from papillæ, and, as they increase in size, will naturally spread out where least resistance is offered. The account of the growth of the leaf of the Tulip Tree has been well given by Sir John Lubbock. The curious truncated form of the leaf was a puzzle, which had been attempted to be solved by

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others, but I think Sir John Lubbock's explanation is the correct one, which I give almost in his own words :—

"Each young leaf is originally enclosed in, and sheltered by, the stipules of its predecessor. In this species they are oval, in form resembling a shallow dish or spoon, so that, when placed face to face, they form a hollow almond-shaped body. Within the hollow thus formed by the stipules are several younger buds, one within the other. In the youngest stage, which need here be mentioned, the petiole is short and thick, the blade widest in the middle, and tapering regularly towards the base and apex (fig. 12); the stipules are in the form of a hemisphere. Gradually the stipules become more and more oval, assuming an almond-like form, somewhat thickest in the middle, tapering away to the sides, and more gradually towards the apex. The petiole has also elongated, and the blade of the leaf is more abruptly turned downwards; so that the petiole passes up one side of the stipule, whilst the mid-rib passes round the tip of the stipule and down again the other side (fig. 13). The blade itself has considerably enlarged, is folded on itself (conduplicate) and lies on one side of the stipule, between its own stipule and one of those by which it is enclosed. It has also modified its form, and for the following reason :—The young stipule at its central part touches the surrounding older stipule, so that the young leaf cannot find room between them; while, on the other hand, at the sides and towards the end of the young stipule there is plenty of space for its growth. This probably accounts for the peculiar shape it assumes. The thickened rib or vein will be arrested sooner than the thinner blade. When stopped by meeting the stipule, it bifurcates (fig. 14); and this is perhaps one reason why the leaf permanently retains that form, which it is thus compelled to assume. The blade grows for a while somewhat more rapidly than the stipule, then the stipule more rapidly than the blade; and, lastly, the growth of the stipule is arrested while the leaf attains a considerable size" (fig. 15).

This explanation will doubtless serve to account for the forms of many, if not of all, leaves. It does so in the case of the Oak, with its peculiarly large rounded lobes; and in the case of unequal leaves, for which Henslow accounted as long ago as 1875, "it is due to the position of the stipules, which lie obliquely across the two edges of the folded leaf, thereby allowing one margin to develop more freely than the other."

The *form of the leaf* is therefore closely connected with vernation, and this branch of the subject opens up a vast field of enquiry; for the different forms of leaves are numerous, and different causes may act to produce the same form. At any rate, a fruitful field of enquiry is open to all.

There is a third branch of the subject still to be noticed, viz., the cause of the rolling up of the edges of some leaves; and why some are folded up, whilst others are flat, or rolled up in the bud. Henslow has written a very instructive Paper on this subject, from which I quote freely. The object of this rolling up and folding is, stated briefly, as a protection from frost and radiation.

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His attention was drawn to the subject from a remark of Darwin, in his Paper on "The Movements of Plants," that "the movements of leaves were to prevent the upper sides from being chilled." Bearing this in mind, he shows that many, perhaps the majority of, leaves, as they develope on the expansion of buds in the spring, assume the same positions as leaves of those particular plants, which are remarkable for sleeping at night, and appear to exhibit a similar care, but in a more perfect way, in protecting the upper surfaces; and the inference to be drawn from all the phenomena presented by growing leaves is the same, viz., to shield their upper surfaces especially from injury caused by radiation, this injury being chill and desiccation. Moreover, it is not an unusual thing for the young leaves only to be subject to sleep, the older ones ceasing to rise and fall by day and night.

The woolliness and external resinous matters have generally been regarded as useful in protecting the buds within from the severity of the winter months, but the special behaviour of the development of leaves and stipules, as well as of the axes and petioles which support them, will all be found to tend to this same object. Hence two special points are kept in view:—

(1) The protection of the upper surfaces;

(2) The securing an erect or dependent position of the blades, so as to place their surfaces vertical.

The efforts of nature to accomplish these two objects during the period of development, and while the young leaves and shoots are succulent and delicate—especially when cool nights, sharp frosts and cutting winds are prevalent—are very various.

The effects of frosts on delicate leaves are twofold: (1) the *margins* of the leaves are especially injured, and (2) they are often more or less dried up. The object of the rolling up of the edges is at once accounted for, viz., to protect the edges from the first of these effects. The second effect led to the conclusion (verified by experiment) that whenever leaves suffered from radiation, there was not only reduction of temperature, but also loss of moisture.

The following are some of the methods adopted by nature for protecting young and developing leaves from injury by radiation:—

(1) *When the leaves are opposite;* the leaves face one another with their upper surfaces in close contact, concealing the bud between them; in some species, as shrubby *Veronicas* and *Hypericums*, so tightly as to seem glued together. The plants in the Natural Order *Caprifoliaceæ* form an exception to this rule: the pairs of leaves have their edges rolled inwards, and one of each pair slightly embraces the opposite leaf, and so wraps the bud within it.

(2) *When the leaves are alternate and erect*, the upper surfaces of different leaves cannot be in contact, consequently each leaf has its two halves folded together (conduplicate), often very tightly so. This is a very common form, sometimes complicated by the leaves being plaited (plicate) as well, as in the Beech or Maple. Or the leaf may be revolute,

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as in the Violet, or rolled round like a cone (convolute) as in the Cherry. In all these cases the margins, the most sensitive parts, are especially protected, as well as but a small portion of the leaf-surface being exposed.

(3) *When the leaves are alternate and pendulous.* The Lime is a very interesting example. "As soon as the bud expands and escapes from the winter scales (which are really stipules) the inner stipules develope considerably (fig. 16); those on the upper side are concave and ovoid, and cover the up-turned edges of the folded leaves, which at once take a vertical position; and the stipules at the sides lengthen much more than the former, furnishing some lateral protection to the whole bud, which now curves strongly downwards (fig. 17) and somewhat resembles a mussel in shape. As the bud continues to develope the branch becomes more and more strongly curved downwards, so that the leaves are held vertically; and as the lower and older ones increase in size they assume a horizontal position and undertake to protect the younger ones, which are concealed beneath them (fig. 18). Thus the protecting care is handed on to each leaf, as it arrives at maturity, until the whole series is developed, and the branch and leaves become horizontal. The process is much the same in the Hazel.

In the Beech the young leaves are merely dependent without any protection even from the stipules; they are but slightly folded and the surface is plicate, and, contrary to what occurs in the Lime, the older leaves hang below the younger ones, which latter have a tendency to be vertical, but not to any great extent. The Beech does not open its buds till after the Lime, when Spring frosts are nearly over.

(4) *When the leaves are compound and erect;* there are two types, digitate and pinnate. In the former, as in the White Lupin, the leaves are folded and erect, forming a small but dense mass. In the latter they are folded, sometimes also plicate, and the leaflets all pressed together laterally, as in the Raspberry and the Rose. In this latter, the adnate stipules protect the developing bud, and the young leaf, when it emerges, is at first erect. In the Pea, the leaflets are at first erect and all pressed together laterally, for the petiole is then very short (fig. 19), but as it grows the leaflets rise above one another (fig. 20), till they can be separated, when they become more and more pendulous till they expand and the leaf ultimately becomes horizontal. In the Garden Bean, the leaves are not only folded, but the margins are rolled inwards (involute), so that the leaflets resemble so many quills.

(5) *When the leaves are compound and pendulous* we have three types—ternate, digitate, and pinnate, of which the French Bean, the Horse Chestnut and the Walnut may be taken as examples.

In the French Bean, when the leaflets are very small they are horizontal, but folded, with their edges uppermost; when a little larger, the petiole bends down and the leaflets are vertical, holding the same positions as when adult and asleep; later on they become horizontal, but sleep at night, falling by night and rising by day. In the Horse Chestnut, the leaf, on emerging from the bud is thickly clothed with hairs,

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but these soon fall off; the leaves, at first erect, then bend downwards more or less covering one another. In the Walnut, the petiole, on first emerging, curves strongly downwards, and the leaflets are folded, so that they are vertical. It is not till near maturity that the petiole rises up and the leaflets are horizontal.

It has been noticed that, if the study of *præ*-floration be important, it is probable that *post*-floration may also be worthy of notice. Some plants lose their calyx, or their corolla, soon after expansion, which, for this reason, have no *post*-floration. Thus the sepals of *Papaveraceæ* and many *Cruciferæ*, and the petals of *Papaveraceæ* and *Cistineæ* fall very soon.

Others have no distinct *post*-floration, their petals retaining, after anthesis, the same arrangements which they possessed before expansion. Saxifrages and *Lycium* are of this class. In *Pelargonium*, these organs become slightly curled.

It is rarely that *post*-floration reproduces *præ*-floration, but it does so n *Malvaceæ* and *Oxalidaceæ*, where the petals are twisted.

The various kinds of *post*-floration have been thus classified:—

(1) *Closed*, as in *Echeveria*, the petals of which approach and close the orifice of the corolla.

(2) *Patulous*, as in *Clematis*, the petals of which, wide in flowering, open still more after fecundation.

(3) *Reflexed*, as in *Begonia*, *Crassula spathulata* and *C. cotyledon*.

(4) *Shrivelled*, as in *Delphinium* and *Lythrum*. The corollas of *Campanula* and *Linaria*, when shrivelling, become twisted irregularly.

(5) *Pulpy*. When the petals become pulpy, as in *Tradescantia Virginica*.

(6) *Curled*. The petals of *Capparidæ*, which are twisted in æstivation, become rolled into a crook after anthesis.

(7) *Re-circinate*. In *Mesembryanthemum*, the petals and ligulæ become rolled into a crook, but from within outwards, or opposite of circinate.

(8) *Conduplicate*, as in *Ornithogalum Eckloni*.

The consideration of post-floration may sometimes help to settle disputed points. Thus *Agrostemma Coeli-rosæ* has been placed under *Lychnis*, *Silene* and *Viscaria*. The question may be much narrowed by considering the post-floration of the petals—in *A. cœli rosæ* the two borders roll inwards, whilst in *Silene* they become shrivelled and contorted. *Plumbago Larpentæ*, again, has been called *Valoradia plumbaginoides*, but it is a true *Plumbago*, for the limb of the corolla becomes rumpled.

The withering of the stamens is also occasionally important. In *Aloë* the three first-formed stamens are the first to shrivel up. Small facts, such as these, may often help to determine questions, where the balance is otherwise very even.

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REVISION OF A GENUS OF FOSSIL FISHES—*DAPEDIUS.*

By Montagu Browne, F.Z.S., F.G.S., Curator of the Town Museum, Leicester. (Read before Section "E.")

In looking up the literature of that family of Fossil Fishes known as *Semionotidæ*, one cannot but be struck with the paucity of memoirs dealing with this group since the time of Agassiz, and this is especially noticeable if, when splitting up this family into genera, we cast our eyes upon what has been written relating to the genus *Dapedius*—a group of fishes not far removed from the *Lepidotidæ*, and of peculiar interest locally, as occurring, in some numbers, preserved in the Lower Lias at Barrow-on-Soar, Leicestershire.

The genus was founded, under the name *Dapedium*, by Dr. Leach, and was first promulgated by De la Béche in a Paper read March 5th, 1819,[1] where, at pp. 44–5, he introduces the genus in the following manner:—"The Lias of Lyme contains also various other fossils, among which may be enumerated the following: A fish remarkable for having rectangular scales, which is much compressed, seldom more than a quarter of an inch thick, most commonly not exceeding one-eighth. It is a very beautiful fossil, from the jet black lustre of the scales: when the fish is fractured, the vertebræ and ribs may be discovered on the inside; the pectoral fins are in general finely preserved. Plate vi., fig. 1, represents one of these fish tolerably perfect;[2] the bones of the skull however are not well preserved. I am indebted to my friend Dr. Leach for the following name and description.

DAPEDIUM.

[ἀ δαπεδον, pavimentum.]

Char. Gener.—*Mandibulæ*; dentibus simplici serie: *dentes* lineares, apice emarginati, hinc bifidi. *Palatum* antice dentibus irregularibus, postice subrotundatis instructum. *Pinnæ*; *dorsalis* unica; *pectorales* acutæ; *caudalis* æqualiter furcata; *analis*, radiis brevibus; *ventrales* breves. *Pellis*, squamis parallelopipedis armata."

Here the matter rested until, in 1835, the great Louis Agassiz, in describing the genus, apologised to Sir Henry de la Béche for altering the

1 "Remarks on the Geology of the South Coast of England, from Bridport Harbour, Dorset, to Babbacombe Bay, Devon. By H. T. De La Beche, Esq., F.R.S., F.L.S., and M.G.S. [Read March 5, 1819.]" 'Transactions of the Geological Society,' vol. i., part I., second series (1822), pp. 40–47.

2 This represents *Dapedium politum*, now known as *Dapedius politus*. See "A Catalogue of British Fossil Vertebrata" (1890). By A. S. Woodward and C. D. Sherborn (p. 59), and was nicely drawn by De la Béche and lithographed by the then celebrated C. Hullmandel. Jaw with teeth, teeth, and the under surface of characteristic scales—the latter very good—are also shown.

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termination and making it *Dapedius*,[3] and with this he split the genus, and proposed the addition of *Tetragonolepis*,[4] thus making two genera—*Dapedius* being founded upon bicuspid teeth, and *Tetragonolepis* upon single-pointed or unicuspid teeth, and to this Sir Philip de Malpas Grey Egerton subscribed, until, in 1853,[5] he stated that these characters were not constant, and that, indeed, both types of teeth had occurred in both of the jaws of a single specimen, notably in a *Dapedius punctatus* in the possession of Lord Enniskillen, and he recommended the fusion of both genera under the name of *Dapedius*, pointing out also that *Tetragonolepis* could not stand for Dapedioid fishes, as Bronn had, before that time, used the name for a genus totally differing from, but mistaken by Agassiz as closely allied to, them. Egerton, therefore, in doing this, appears to have corrected two serious errors into which Agassiz had fallen—viz., using *Tetragonolepis* for other than Pycnodont fishes, and also making a generic distinction where none could be maintained. In the following year, 1854,[6] Egerton, however, with the sanction of Agassiz, unnecessarily recanted, and again admitted generic distinction between the unicuspid and bicuspid specimens, retaining the name *Dapedius* for the latter, and proposing *Æchmodus*[7] for the former in substitution of *Tetragonolepis*. But in 1878 he withdrew the name of *Æchmodus*,[8] and re-affirming his contention that the generic distinction founded upon teeth could not be maintained, again proposed the return to *Dapedius* as a generic and inclusive term for Dapedioid fishes. At the present moment, therefore, *Dapedius* includes *Dapedium*, *Tetragonolepis* of all authors unless founded upon the *Tetragonolepis* of Bronn, and *Æchmodus* of all authors, and this has been subscribed to by Quenstedt,[9] A. Wagner,[10] Traquair,[11] Zittel,[12] A. S. Woodward,[13] and other authors.

Following, appropriately, would come the osteological and other characters of *Dapedius* described by that eminent palæontologist, Professor Karl A. von Zittel, at pp. 205-6 of his "Handbuch," previously mentioned. "Large or medium-sized fishes of deep rhombic ovate form, laterally compressed; scales rhombic or rhomboidal, in the middle of the flanks higher than broad, thick, brilliantly enamelled, smooth or

3 "*Poissons Fossiles*," Tome ii., p. 181.

4 "*Poissons Fossiles*," Tome ii. (1835), p. 181. (Agassiz seems, however, in *1832*, to have used the generic *Tetragonolepis* in connection with the uncertain species *pholidotus* in the "Neues Jahrbuch," p. 147.)

5 'Quarterly Journal of the Geological Society,' vol. ix., pp., 274-5.

6 'Quarterly Journal of the Geological Society,' vol. x., p. 367.

7 From ἀιχμή, a point, and ὀδούς, a tooth.

8 "Memoirs of the Geological Survey of India," Palæontologica Indica [4], ser. 4., part 2, pp. 7-8.

9 "Der Jura," (1858), pp. 223-9.

10 A. Wagner, "Gelehrt. Anz. k. bay. Akad. Wiss.," vol. 1, (1860), p. 95.

11 "On the Structure and Affinities of the Platysomidæ," 'Trans. Roy. Soc., Edinb.,' vol. xxix. (1879), pp. 343-391.

12 "Handbuch der Palæontologie," I. Abtheilung, Palæozoologie, III. Band. I. Lieferung, (1887), pp. 205-7.

13 Woodward and Sherborn, *op. cit.* pp. 57-60 (references only).

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ornamented. All fins set with fulcra, whose halves coalesce towards the points. Dorsal fin of considerable length, beginning in the middle of the body, pectoral and ventral fins small, anal fin tolerably large, opposite to the dorsal fin. Caudal fin slightly cleft, semi-heterocercal, squamation of the upper lobe more produced than that of the lower. Head-bones granulated; operculum, sub-operculum and inter-operculum large, curved; præ-operculum either completely hidden or only visible as a small streak above the inter-operculum. Eyes surrounded by a closed ring of small, quadrilateral plates (*c o*) behind which five to eight post-orbitals (*s o* cheek-plates) follow. Also the supra-temporals (*s t*) and post-temporals are developed in great number. Parietal bones (*p*) somewhat smaller than the frontal bones (*f*). Opening of the mouth short. Under jaw almost as high as long. All jaw-bones set on their outer edge with club-shaped, yet somewhat pointed, teeth; toward the interior the teeth become small, almost brush-shaped. Between the leaf-shaped branchios-tegal rays lies a median, egg-shaped jugular-plate. The clavicular is posteriorly margined with enamel. The mucus-canal lies in the upper half of the flanks. Spine cartilaginous consisting of half-vertebræ; arches, spinous-processes, ribs and fin-supports ossified."

* * * * * * * * * * * *

"The oldest fragments are obtained from the Alpine Keuper of St. Cassian and from the Rhætics of Seefeld (*D. Bouéi* Ag.) and Länggries (*D. alpinus* Winkler). In the Lias occur more than 20 species, of which the smallest measures about 0, 12, the largest about 0, 5^{m} in length. Especially rich in species are the Lower Lias of Lyme Regis in Dorset (*D.* [*Aechmodus*] *punctatus*, *speciosus*, *Leachii* Ag. with cleft, and *D. politus* de la Bêche, *D. monilifer* Ag. with single-pointed teeth); further the Upper Lias-slates (Liasschiefer) of Boll, Holzmaden, Ohmden in Würtemburg. The contemporary beds of Banz and Altdorf in Franconia and Curcy in Calvados have also supplied isolated remains. (*D. pholidotus* Ag., *D. ovalis* Ag.; *D. caelatus* Quenst., *D. maeandrinus* Wagner;) *D. Magnevillei* Ag. is more probably derived from the Upper Lias than from the Oolite of Caen. *D. Egertoni* Syk. Gondwana, East India." [14]

The general literature bearing upon the species of *Dapedius* is by no means extensive, for, with the exception of the authors previously mentioned, there are but scattered references and one or two memoirs, all of which will be noted when dealing with the various species, or when dealing with the general bibliography of the subject at the conclusion of this series of articles. Admitting the paucity of detail for so important a group, it will be readily understood that when, in answer to my appeal for more light, Mr. A. S. Woodward, F.Z.S., F.G.S., of the British Museum, wrote:—"With regard to *Dapedius*, if you want a detailed memoir up to date you must write it yourself or join me in the undertaking; no such thing exists," I was naturally dismayed, especially

14 Some of these will prove to be synonymous.

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as the material waiting identification was puzzling in its fine shades of so-called specific characters, when viewed by the light of Agassiz' memoir. Since that time Messrs. Woodward and Sherborn have issued their most useful and exhaustive catalogue previously referred to, and here many of the species have suffered extinction, and I fear the present attempt to contribute to a revision of the genus will result in a still further thinning out of weakly species.

One thing is remarkable in the history of the group, which is, that from 1835 to 1854—nearly twenty years—two genera should have been founded upon examples which possessed differing attributed generic dental characters in the *same specimens*. I say remarkable because, in so many of the fishes possessed by the Leicester Museum, the same thing can be seen, and *most* remarkable because, in a specimen of *Dapedius*[15] (? *orbis*) kindly lent by the authorities of the Scarborough Museum, and which is probably the one Agassiz states that he saw, two different kinds of teeth are plainly to be seen together in what is probably the pre-maxillary of the specimen.

As for some little time the writer will be unable to visit the National collection, and some provincial Museums where fishes of this group are to be found, remarks in this introductory chapter will necessarily be brief: but few species can at present be discussed, and those not in their proper zoological sequence.

It is proposed, therefore, to make a commencement with two of Agassiz' species which, owing to material at hand, and other material examined by the writer, offer the best facilities for their proper determination. It will be advisable, probably, to make a *précis* of Agassiz' determination in the following form:—

DAPEDIUS.

DORSALIS.	MONILIFER.
FORM.	
Oval, oblong.	Nearly circular; broadest of all the species known.
EXTREME LENGTH AND BREADTH.	
About 6 inches by 3 inches.[16]	Nearly 5 inches by 3 inches.[17]
HEAD.	
Short, but broad, with the bones wrinkled, and a not very compact granulation, especially on the operculum.	None seen but the posterior part of the skull and fragments of the opercular pieces, too broken for their form to be described.

15 This specimen had upon it a label, evidently of some antiquity, turned upside down, which read:—

Fossil Fish
DAPEDIUS
orbis, Ag.?
} Lias, Barrow, Leicests. Presented by Dr. MURRAY.

16 Measured from the Barrow Specimen (No. $\frac{725}{'89}$) in the Leicester Museum.

17 Measured by the writer from the type Specimen in the Bristol Museum, which is, of course, imperfect.

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PECTORAL ARCH.

Equally granulated.	Not mentioned.

LATERAL LINE.

Very visible; it extends almost directly, with a slight flexion towards the back, from the superior and posterior angle of the operculum to the middle of the pedicle of the tail.	Goes directly from the superior angle of the operculum to the middle of the pedicle of the tail.

SCALES.

Perfectly smooth; margins straight and entire; there is no notch in their posterior margin; fairly large, especially on the sides of the abdominal walls, but much smaller on the tail and along the back.	Quite smooth, except towards the base of the enamel on the anterior margin, where raised points may be remarked arranged in series like the beads of a rosary, but which are wanting in the scales of the pedicle of the tail; margins straight, without notch. The centre is slightly depressed. Those on the abdominal walls are the largest.

PECTORAL FIN.

But indistinct traces remain.	Gone entirely.

DORSAL AND ANAL FINS.

Dorsal begins a little in front of the middle of the back, and ends opposite the posterior extremity of the anal, which is shorter almost by half.	Dorsal extends from the middle of the back to its narrowest part; the anal, which is half the length, ends at the same height.

VENTRAL FIN.

Placed opposite the anterior margin of the dorsal.	Very small, opposite to the anterior margin of the dorsal.

CAUDAL FIN.

Proportionately large; superior margin cut nearly squarely, having but one emargination.	Proportionately large, and cut squarely.

There are several other distinctions without differences, which are certainly not of specific importance, and, in considering the claims of these two to rank as independent species, we first remark the stress which Agassiz places upon *monilifer* (the commoner species) being much broader than *dorsalis*. We may dismiss this as being of no importance whatever, a greater or less amount of pressure causing a greater or less flattening, and consequent broadening of the specimens subjected to excessive pressure.

The second point dwelt upon is, that in the rarer *dorsalis* the operculum is wrinkled and granulated, as is also "the thoracic cincture."[18] Nothing is said as to the sub-operculum, but this, as will be shown, is also

18 Pectoral arch.

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(though more sparsely) beaded and wrinkled. And, having insisted on this very characteristic wrinkling and granulation, he separates it from *monilifer*, which he described as a separate species from a specimen without a head, and which was, of course, useless for comparison as regarding the opercular region.

The tails of both are alike, and the descriptions of the lateral lines of both are similar, excepting that in *dorsalis* it makes a slight flexion toward the back, but this is, of course, also a point to be dismissed, as of not much importance. All the remainder of the descriptions will do equally well for both species, excepting an important statement that, whereas the scales of the rarity are perfectly smooth, showing only their lines of growth, those of *monilifer* are beaded on their anterior margins, and have an oval depression in the middle.

It was, then, with considerable pleasure that, some few months ago, a small fish was collected at Barrow-on-Soar which agreed precisely with Agassiz' figure and description, and was therefore labelled as *Dapedius dorsalis* — apparently the second recorded specimen from Barrow. Looking at it, however, in another light, on some scales in the nuchal region the beads could be seen arranged in series "like those of a rosary," and some faint depressions, these two characters being those of the commoner *monilifer*. In a bright light, however, the depressions disappeared, and apparently they were an optical illusion caused by a slight elevation of the concentric lines of growth, the innermost of which, being small, cast a shadow, thus giving the false idea of a hollow where none existed. In other parts of the body there were perfectly plain small scales, and, saving the sculpture of the head, *dorsalis* and *monilifer* were represented in the same specimen. If, therefore, this sculpture of the opercular could be found upon *monilifer*, any contention as to one species being made to do duty for two would be affirmed. Mr. A. S. Woodward, of the British Museum, kindly consented to look up the type specimen of *dorsalis*, and also to examine the head of one of Agassiz' specimens of *monilifer* to see if he could distinguish it from *dorsalis*. His reply was:—"The head and opercular apparatus of the specimens labelled *monilifer* seem to me exactly the same as in *dorsalis* in ornament and form."

Having, therefore, provisionally decided the position of *dorsalis* with regard to *monilifer*, it was with considerable interest that, by the courtesy of Mr. E. Wilson, F.G.S., I was enabled to examine the type specimen of Agassiz' *monilifer*. It is a small, but broad, fish, nearly five inches by three inches, on a thick block of lias, and shows but one or two faint traces of what are probably remnants of the *op.*, *s. op.*, and *s. t.*, but on these there are clear indications of beading, and what may be one or two corrugated lines or wrinklings, but difficult to determine owing to the small size of the fragments. There is, however, little doubt that the head was characteristic of *dorsalis*. Regarding the character of the scales, the "beading," as described, is, though very faint, pretty general over the anterior part of the body, and not half so plain as in the Barrow speci-

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mens; but the distinct oval depressions in each, figured as characteristic of *monilifer*,[19] do not exist. It is quite true that there are apparently traces of a general depression following the lines of growth, but this, if not an optical illusion caused as before stated, may be a concavity caused by the shrinking of the scales, and is clearly not a character to be depended upon, nor indeed is the "beading" upon the anterior edges of the scales—a general character of most species—of any value.

The posterior edges of nearly all the scales are extensively fractured, and perhaps set somewhat vertically, and although there is a well-preserved caudal, dorsal and anal, yet no pectorals nor ventrals are to be seen, and it is remarkable that, with all these defects and fancied differences, it should have been considered advisable by Agassiz to found a new species upon such a mutilated specimen. It appears to agree exactly with the specimen previously described, and with others, belonging to the Leicester Museum, which are typical of *dorsalis* by head characters, and of *monilifer* by others. The contention is, therefore, that these two species of Agassiz are identical, and this is strengthened by several other specimens lately acquired. Furthermore, Mr. Woodward writes that a specimen in the British Museum (p. 3530 x.) is labelled by Agassiz as *monilifer*, whilst its counterpart is labelled—also by Agassiz—as *striolatus*!!

Here, then, are three species which may probably be referrible to one, and I have a suspicion that the so-called *dorsalis* = *moniliter* = *striolatus* are but young forms of one of the larger species of *Dapedius*—probably *orbis*, or *granulatus* which has the "rosary" very well shown upon each scale—but at present this cannot be stated positively until the British Museum and other collections have been gone through; nor can the exact synonomy be decided until the question has been settled as to what species of *Dapedius* these young forms are attributable: the synonomy will, therefore, rest as shown below, compiled in greater part from Woodward and Sherborn *(op. cit.)*.

Dapedius dorsalis: A. S. Woodward and C. D. Sherborn, "Cat. Brit. Foss. Vertebrata," p. 58; Montagu Browne, "Vertebrate Animals of Leicestershire and Rutland," p. 194.

Tetragonolepis dorsalis, L. Agassiz, "Poiss. Foss.," vol. ii., pt. i, (1837), p. 211, pl. xxi., f. 1, 2, pl. xxi. *a*, f. i.

Æchmodus dorsalis (P. M. G. Egerton, 'Quart. Journ. Geol. Soc.,' vol. x., 1854, p. 367), J. Morris, "Cat. Brit. Foss.," 1854, p. 316.

Loc. Lias; Byrford, Gloucestershire. [Fish; Brit. Mus.]

fimbriatus, Agassiz, *v.* Eugnathus latus.

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19 "*Poissons Fossiles*," Tome ii., pl. 21a.

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PLATE I

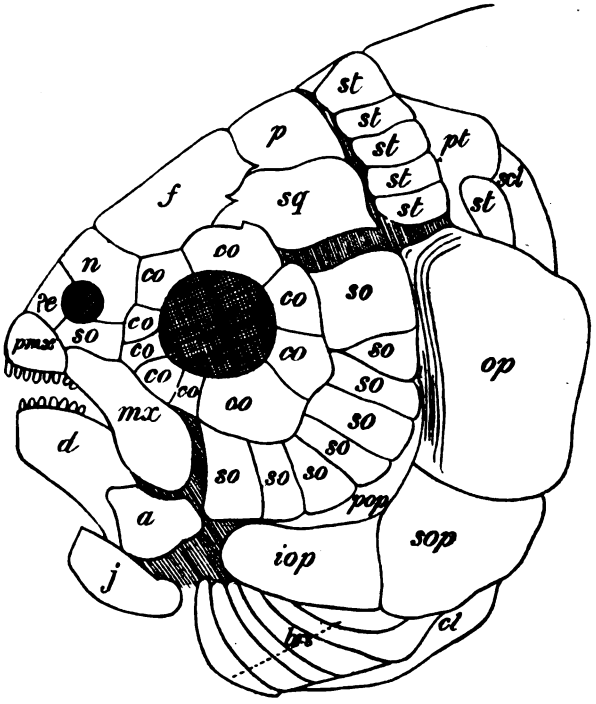

Fig. 1.

P.mx., pre-maxillary; *mx.*, maxillary; *s.o.*, *s.o.*, sub-orbitals; *c.o.*, *c.o.*, circum-orbitals; *?e.*, ?ethmoid; *n.*, nasal; *f.*, frontal; *p.*, parietal; *sq.*, squamosal; *s.t.*, supra-temporals; *p.t.*, post-temporal; *s.cl.*, supra-clavicle; *op.*, operculum; *s.op.*, sub-operculum; *p.op.*, pre-operculum; *i.op.*, inter-operculum; *cl.*, clavicle; *brs.*, branchiostegals; *j.*, jugular plate; *a.*, angular; *d.*, dentary.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

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Dapedius monilifer (Agassiz), J. Morris, "Cat. Brit. Foss.," 1854, p. 324; A. S. Woodward and C. D. Sherborn, "Cat. Brit. Foss. Vertebrata," p. 59; Montagu Browne, "Vertebrate Animals of Leicestershire and Rutland," p. 195.

Tetragonolepis monilifer, L. Agassiz, "Poiss. Foss.," vol. ii., pt. i. (1837), p. 212, pl. xxi. *a*, f. 25.

Tetragonolepis striolatus, L. Agassiz, *ibid.* (1843), p. 304 (name only). [Specimen labelled by Agassiz, in Brit. Mus.]

Loc. L. Lias; Barrow-on-Soar. [Fish, wanting head; Bristol Mus.]

Explanation of Plate I.

Fig. 1 represents head of *Dapedius*, after Traquair (*op. cit.*, Plate VI., fig. 13), but enlarged to size of a specimen in the Leicester Museum, and altered by the substitution of '*j*' for '*br*,' and of '*brs*' for '*br*,' and by the addition of '*fe*' and '*pop*.'

Fig. 2 represents associated, single-pointed and (?) compound teeth, from the Scarborough specimen.

Fig. 3 represents associated, double, or bicuspid teeth, from a specimen $\left(\text{No. } \frac{205}{'90}\right)$ in the Leicester Museum.

Fig. 4 represents upper surface of scale from a specimen $\left(\text{No. } \frac{894}{'89}\right)$ in the Leicester Museum.

Fig. 5 represents under surfaces of two scales in apposition, from the same specimen as fig. 4.

ALL NATURAL SIZE.

(To be continued.)

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

There have not been any Meeting of this Section held during the last quarter.

W. SIMPSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

June 18.—Exhibition of different kinds of Woods.—A very large number of specimens was exhibited by Miss KINDER, Mr. MOTT, and the CHAIRMAN.

Also of Flowers by Miss NOBLE, Miss ANDERSON, and Dr. FINCH; and of Fungi by Mr. VICE.

It was decided that the reading of the Paper should always begin at 7-30, further exhibits and discussions being deferred till after it was finished.

Paper.—The CHAIRMAN gave a short analysis of Professor Henslow's "Origin of Floral Structures." After tracing, by actual dissection, the connection between the four whorls of the flower with one another, by means of their vascular cords, he discusses the causes of the origin of the *number of parts* in each whorl. He then shows how the *shapes* of the different flowers are produced by insect visits, (1) by the constant settling of bees, and other insects, upon one particular part of the flower, thus causing it to be unsymmetrical, and (2) by the irritation set up by the oft-repeated contact of their bodies and legs, thus producing other changes in form, just as (to select only one of the many examples which might be produced) the wearing of tight boots causes corns on the feet.

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The Excursion to Wymeswold, proposed for June 11th, had to be abandoned on account of the weather.

Among the more interesting specimens of woods exhibited may be mentioned—Ebony, Satin-wood, Irish Bog Oak, Greenheart, Lignum-vitæ, Cashaw, Braziletto, Bullet Tree, Olive, Cassia, Jack Fruit, Manchineel, Quassia, Orange, Divi-divi, Fustic, Yucca.

July 16.—Exhibition of Caterpillars.—Mr. STORER exhibited a fine collection of preserved Caterpillars, and the CHAIRMAN some diagrams, illustrating some of the more striking forms, and the various modifications of some of the legs.

Paper.—Dr. FINCH read a Paper on "The Grasses of Leicestershire," illustrated by a series of fresh specimens of each of the genera enumerated; as well as a large number of ornamental grasses.

Mr. COOPER reported the discovery of *Thlaspi arvense*, near the Bridle Road from Leicester to Thurcaston, and of *Malva moschata* at Beaumont Leys; both species new to District v.

The following flowers of interest were afterwards exhibited: *Sidalcea candida*, *Spiræa odorata*, and a Yellow Scabious, by Mr. MOTT; *Colutea arborescens*, *Trifolium scabrum* and *T. arvense*, by Mr. E. F. COOPER; *Coronilla varia* and *Ceratochloa unioloides* (sometimes sold as *Bromus Schraderi*), by the CHAIRMAN. The latter is a native of the Andes, and had been introduced formerly for fodder: it has occurred as a casual in Thurcaston.

Dr. FINCH also exhibited *Catabrosa aquatica*, found by himself, Dr. COOPER and Mr. W. CARTER, at Whadborough, near Tilton. This grass has not been previously noticed in the County during the modern period. (See "Flora of Leicestershire," page 180.)

List of specimens of Fresh Grasses shown by Dr. FINCH, July 16th, 1890.

LEICESTERSHIRE GRASSES.

Phleum pratense	Phalaris canariensis
Aira cæspitosa	Agrostis vulgaris
Holcus lanatus	Lolium perenne
Arrhenatherum avenaceum	Bromus mollis
Bromus asper	Poa annua
Bromus sterilis	Hordeum pratense
Festuca elatior	Avena flavescens
Dactylis glomerata	Triticum repens

Digraphis arundinacea, v. Phalaris arundinacea

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CULTIVATED GRASSES.

Agrostis pulchella	Bromus brizæformis
„ plumosa	Avena sterilis
„ nebulosa	Lamarckia aurea
Briza maxima	Lagurus ovatus
„ gracilis	Hordeum jubatum
„ compacta	Dactylis glomerata variegata
Brizopyrum siculum	Panicum variegatum

Mr. MOTT reported that he had received a note from Mr. ATKINS, regretting that the unfavourable weather had prevented the Section from carrying out the intended excursion to Hinckley, and hoping that the Section would be able to visit him before the end of September.

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

July 7th.—The question of the election of a Vice-Chairman having been discussed by the Members, Mr. F. F. How proposed and Mr. J. D. PAUL seconded the election of Mr. MONTAGU BROWNE, F.Z.S., F.G.S. The resolution was carried.

An excursion to Barrow-on-Soar was arranged for Saturday, August 9th.

Miss EDGE, of Craven House, Princess Road, was unanimously elected a Member of the Section, and Miss E. A. HAYES, of St. Saviour's Road, was also elected an Associate, on the proposition of Miss A. SQUIRES.

The SECRETARY read a letter from the Rev. A. L. SPARKES, who was announced to deliver an address upon the Natural History and Ethnology of S. America, stating that he had been unexpectedly called to London, and would consequently have to defer his Paper until the September Meeting.

Two communications were brought forward to supply the deficiency, one by Mr. MONTAGU BROWNE dealing with some recent excavations in the neighbourhood of the Spinney Hills, in which he contrasted the beds exposed, with the Lias of Barrow and other county localities, and discussed their mutual relationships; the other by Mr. F. F. How, giving an interesting account of Lord Ilchester's Swannery near Weymouth,

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which he had recently visited. The Papers were illustrated by specimens, diagrams, and photographs, and at their conclusion votes of thanks were unanimously accorded to their respective authors.

The VICE-CHAIRMAN exhibited—

A fine specimen of Copper Ore from Bardon Quarries, recently presented to the Museum by Mr. J. ELLIS. Mr. J. D. PAUL, in commenting upon the occurrence of this Mineral in the County, said that he believed it had been found in small quantities at Groby. He also remarked that Lead had been found on the Forest, and Tin near the Monastery at Whitwick, a field in that locality being known by the significant title of "Tin Meadow."

The SECRETARY exhibited—

Preparation of the shell, dental apparatus, &c., of the Common Sea Urchin (*Echinus edulis*)—an example of a "regular" Euechinoid—in which the chief morphological characters were clearly shown by the use of colour on the actual parts, a condensed description of the principal points of interest being also placed with the specimen.

August 9th.—Geological excursion to Barrow-on-Soar.

The party, under the guidance of Mr. MONTAGU BROWNE, first visited the grounds of Barrow Cliff, through the kind permission of Mr. W. J. WOOLLEY, where the occurrence of the *Avicula contorta* series was demonstrated and a short address given by Mr. BROWNE; afterwards proceeding to view the Lias exposures in Messrs. ELLIS' pits, where the various bands and zones, so well shown in some of the excavations, were described, diagrams being used to enable Members to follow Mr. BROWNE'S remarks more closely. Before leaving, a number of the commoner Lias fossils were collected.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1890.

Oct. 6.—Inaugural Address of the PRESIDENT—"Culture."

,, 20.—WHITWORTH WALLIS, Esq., F.S.A., F.R.G.S.—"Pompeii." (Illustrated.) (*Director of the City of Birmingham Museum and Art Gallery*).

Nov. 3.—HERR SCHMIDT—"Felix Mendelsohn Bartholdy." (With Illustrations.)

,, 17.—Prof. H. MARSHALL WARD, M.A., F.R.S., F.L.S. (Professor of Botany in the Royal Indian Civil Engineering College, Cooper's Hill, Egham)—"Green Leaves." (Illustrated.)

Dec. 1.—The Right Rev. BISHOP MITCHINSON—"Plant Distribution in Great Britain."

,, 15.—HOWARD S. PEARSON, Esq., (Lecturer in English Literature and History at the Birmingham and Midland Institute)—"The Days of Good Queen Anne." (Illustrated.)

1891.

Jan. 12.—Sir WILLIAM WILSON HUNTER, K.C.S.I., C.I.E., M.A. (Oxon.), LL.D. (Cantab.)—"The New Leaven in India."

N.B.—This Lecture will be given in the Temperance Hall.

,, 26.—Rev. P. T. FORSYTH, M.A.—"Tennyson's Idylls in their Epic Unity."

Feb. 9.—Prof. RAPHAEL MELDOLA, F.R.S., F.R.A.S., F.C.S., F.I.J.C. (Professor of Chemistry in the Finsbury Technical College, City, and Guilds of London Institute)—"A Romance of Applied Chemistry. (Illustrated.)

,, 23.—A. H. PAGET, Esq.—Recital from "Twelfth Night."

Mar. 9.—Prof. OLIVER LODGE, D.Sc., LL.D., F.R.S. (Professor of Physics in University College, Liverpool)—"Electrical Waves." (Illustrated.)

,, 23.—BERNARD DE LISLE, Esq., B.A.—"The Drama as a means of Education."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. WILLIAM SIMPSON, 1, Brighton Villas.

Secretary—Mr. JNO. SCAMPTON, 1, Pelham Street.

October 21.—The CHAIRMAN: "The Future of Political Economy."

November 18.—Mr. A. H. PAGET: "The Elizabethan Play-Houses."

December 16.—Mr. R. HARVEY, LL.B.: "George Borrow."

The Meetings are on the third Tuesday in each month, at 7 p.m., in Museum Council Room.

WILLIAM SIMPSON, *Chairman.*

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SECTION "D."

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston Rectory.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

FIELD DAYS—The second Wednesday in each Summer month, at about 3 p.m.

EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.

October 8.—Fungus Foray to Great Stretton Hall.

,, 15.—Exhibition of Legumes.

Paper on "The Kew Herbarium" by the CHAIRMAN.

November 19.—Discussion on the Formation of a Leicestershire Herbarium.

December 17.—Exhibition of Microscopic Slides of Animal Tissues.

, Paper on "Weeds," by Mr. F. T. MOTT.

T. A. PRESTON, *Chairman.*

SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.

Vice-Chairman—Mr. MONTAGU BROWNE, F.Z.S., F.G.S.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1890.

October 13.—Paper by Mr. H. E. QUILTER: "The Palæontology of the Leicestershire Lias."

November 10.—Paper by the CHAIRMAN: "Micro-organisms, and their Relations to the Higher Animals" (Illustrated).

December 8.—Paper by Mr. F. F. HOW: "Some Descriptions of Australian Bird-life" (Illustrated by specimens; also photographs of Australian scenery).

The Paper for the evening will be read at 7.45, any business before the Section being then adjourned.

F. M. POPE, *Chairman.*

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E. F. COOPER, F.L.S.
J. D. PAUL, F.G.S.
GEORGE STEVENSON.

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A. H. PAGET.
J. D. PAUL, F.G.S.

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A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,

Chairman, WM. SIMPSON.
Secretary, JNO. SCAMPTON,
1, Pelham Street.

D. BIOLOGY (BOTANY AND ZOOLOGY).

Chairman, REV. T. A. PRESTON.
Secretary, J. J. W. KNOWLES,
25, St. Stephen's Road.

E. ZOOLOGY (With which is amalgamated Section **C.** GEOLOGY).

Chairman, F. M. POPE, M.B.
Secretary, F. R. ROWLEY,
Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1890-91.

OCTOBER TO DECEMBER, 1890.

GENERAL MEETINGS.

October 6th, 1890.—Inaugural Address of the President (F. T. MOTT, Esq., F.R.G S.), on "Culture." (Printed at page 223.)

October 20th.—WHITWORTH WALLIS, Esq., F.S.A., F.R.G.S. (Director of the City of Birmingham Museum and Art Gallery), on "Pompeii."

THE lecturer, after a few introductory remarks, said it was a matter of no ordinary interest when it became known in the middle of last century that that terrible mountain, Vesuvius, had preserved for us a perfect Roman city, a living picture of a former age, 2,000 years ago, which had fortunately escaped the ravages of time and also the pillage at the hands of those barbarian conquerors who, as they knew, as a rule, swept away so many records of the past which they might otherwise have had.

Pompeii was founded 600 or 700 years B.C., and, eighty years before the birth of Christ, had become subservient to Rome. Sixteen years before the commencement of his story a terrible earthquake had shaken to the foundations the principal public and private buildings of the city, and the inhabitants set about restoring the city somewhat more in accord with the tastes of Imperial Rome.

Pompeii was about fourteen miles from Naples, and Herculaneum was eleven miles, and both places became in that period what he might term the pleasure resorts and summer seats of the Roman aristocracy, and after the earthquake the Roman patricians resolved, when rebuilding and redecorating their houses, to do it with greater splendour and extravagance.

The lecturer proceeded to give a graphic account of the catastrophe which befell the city on August 4, in the year 79, and he referred to the record which the younger Pliny had left of the terrible night. In three days the city had disappeared, and the ruins were covered with white pumice stone and hardened mud. No attempt was made to rebuild it, but soil accumulated above the pumice and the mud, and the city remained wrapped in its lava shroud for 1800 years. In the eighteenth century some peasants, while digging, found some statuettes, and excavation began. It was at first, however, only carried out in a perfunctory manner, and for the sake of discovering valuables, and it was not until

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1863 that a legitimate plan of operations was decided on. No one who had not taken part in such work could understand the excitement of the work of excavation at Pompeii, for they did not know what the next spadeful of earth might bring forth, or what phase of Roman art it might illustrate.

The lecturer then proceeded to give a detailed and very interesting account of the results of the excavations, and showed the immense amount of information about Roman life and art which had been derived from the ruins of the buried city. The lecturer was accompanied by an admirable series of views shown by an oxy-hydrogen lantern.

November 3rd.—Herr SCHMIDT, on "Felix Mendelssohn-Bartholdy."

Herr SCHMIDT said among the once celebrated but now almost forgotten art-centres of Northern Europe, the nurseries of song, the foci whence from time to time bright flashes of creative genius had radiated far and wide, few had laid the world under deeper obligations than sober, business-loving Hamburg. In that town was born, on February 3, 1809, one of the brightest musical geniuses of the present century, Felix Mendelssohn-Bartholdy, of whom and whose music he wished to speak that evening. He was one of those fortunate children over whose cradle both the Muses and the Fates united their hands in friendship. He was allowed to pursue his career unhampered by the needs and material troubles of ordinary life. Never struggling with any great sorrow or care, his genius broke forth into blossoms and flowers of delightful fragrance and beauty, and both his musical and purely human existence were pervaded by the same harmony of happiness and peace. Many of our great composers had received more worship and admiration, but none were loved so well as Mendelssohn. He was not what might be called one of the great heroes of song, lacking that overflow of genius, that Titan power which constitutes one, and he never felt the stress and storms of life which alone were able to develop a hero such as Beethoven. Hence there was no great display of passion in any of his compositions, but everywhere was found measure and moderation, and never did he overstep the limits of the beautiful.

One of the most eminent living artistes—Hans von Bulow—called Mendelssohn the greatest in form after Mozart, and nobody would contest the truth of that statement who recognised the tenderness and chastity of conception, the grace and dignity of expression as the characteristic features of Mendelssohn's method of creation. And this nobleness had found expression in all his works, to whatever class of composition they might belong. His particular genre of composition was a lovely, sweet, flattering, and dreamy nature. He was greatest when he spoke in the etherial voice of the spirits, in the enchanting sounds of nature; when with his magic wand he captivated us by his light and airy tone-pictures. But he was also great in another and more

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sublime branch of his art, where he had at heart the glorification of his faith, and all the warmth of his religious feeling was displayed. In the first-mentioned style of composition he followed above all others his kindred genius, Weber, as his guiding star. But for the oratorio he returned with reverence to the master-works of the last century, and made Handel and Bach his models. Following in their footsteps, and at the same time infusing into his sacred music the spirit of Haydn, Mozart, and Beethoven, he succeeded in finding a new expression in music for religious feeling, and in blending, as it were, the musical spirit of the past with that of the present.

The lecturer proceeded to speak of the childhood of his subject, remarking that a more intimate acquaintance with that chapter of the composer's life threw a strong light of understanding on the later phases of his career, both as a musician and as a man. In 1818 Felix performed first in public, and in the following year entered the Berlin "Zinga-cademie." He now began to compose diligently, and some of his childish works showed a marvellous aptitude for construction and the expression of definite musical ideas. In 1820 he wrote a number of pieces, comprising altogether nearly sixty distinct movements. The MSS. of these formed part of the great collection now preserved in the Berlin Library, a priceless series of records, showing the steady progress of his art-life from the period of its first awakening in early childhood to that of its full maturity and premature extinction in 1844.

Alluding to the similarity existing between Mendelssohn and Schumann as to their prominence as German song writers, Herr Schmidt said their contributions were not only marked by numbers, but also by their excellence. Mendelssohn wrote about 140 songs. They might be said to have introduced the German "Lied" into England, and to have led the way for the deeper strains of Schumann, Schubert, Brahms, and also for the more recent vocal compositions of Grieg, the Norwegian composer. No doubt the songs of those composers did touch lower depths of the heart than Mendelssohn's, but the clearness and directness of his music, the spontaniety of his melody, and a certain pure charm pervading the whole, had given a place in the great musical public to some of his songs which they would probably retain for a long time to come. His "Songs without Words" had enriched the repertoire of pianoforte music with a form of composition which lent itself easily to the transfer of momentary impressions. If works in this new form lacked the grace and refinement of Mendelssohn they degenerated into mere bagatelles. These songs stood by themselves. They were specially interesting to Englishmen, and had attained great popularity in this country. His orchestral and chamber works were much played and greatly enjoyed here, but it was to his oratorios, songs, songs without words, and part-songs, that he owed his firm hold on the mass of the English people. He failed in his attempts to write operas, not possessing the required dramatic gift, and unable to raise his musical expression to the necessary climax, and only the music to the *Midsummer Night's Dream* and *Antigone* had retained

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its position on the modern stage. But if not successful in opera, he showed himself a master in his oratorios, especially in *St. Paul* and *Elijah*. These oratorios were not mere copies of productions of the earlier masters, for their spirit was thoroughly modern, and they showed everywhere the characteristic features of this composer. Although he often failed to attain the sublime grandeur of the great masters, one must admire the earnest and energetic perseverance in which he pursued his subject, and recognise the fact that no one since his time had been equally successful in infusing into sacred music the dramatic and epic spirit. He was one of the first to attempt and to succeed, like Beethoven in his pastoral symphony, in producing without poetical and vocal aid grand pictures of nature; and these compositions were often replete in local colouring solely produced by the orchestra.

In conclusion, the lecturer said that hardly any man could be found in whose life there were so few things to conceal or to regret. It might be thought that his music would suffer from his "habitual cheerfulness," but who could wish that such a bright and pure spirit should have been dulled by distress, or crushed by cares? It might have lent a deeper undertone to his songs or have enabled his adagios to draw tears, where now they only gave a saddened pleasure. But they must take the man as they had him. Surely there was enough of conflict and violence in life and art, and it was well in these agitated modern days to be able to point to one perfectly balanced nature, in whose life, whose letters, and whose music alike all was at once manly and refined, clever and pure, brilliant and solid. For the enjoyment of such a shining light they might well forego the depths of misery and sorrow.

A number of illustrations from Mendelssohn's works were then given by Miss Downing (pianoforte), Miss Stanyon (contralto), Rev. W. E. Terry (violoncello), and Herr Schmidt (violin). The selections were as follows:—Trio in D minor Op. 49 (piano, violin, and 'cello); capriccio in A (pianoforte), "The Garland" (vocal); romance without words ('cello); second movement from a violin sonata composed at twelve years of age.

November 17th.—Professor H. MARSHALL WARD, M.A., F.R.S., F.L.S. (Professor of Botany in the Royal Indian Civil Engineering College, Cooper's Hill, Egham), on "Green Leaves."

Professor WARD said that he wished at the outset to carry their minds back to years long past, before the Western civilization was even thought of, and try to picture to their minds what leaves must have appeared to the ancients. There was no doubt that those ancients knew very little about leaves as considered from the standpoint of science now taken. Probably their most forcible notion of a green leaf was that connected with æsthetic beauty. At any rate they were pretty certain that the

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Greeks looked on green leaves as objects which had a form to be copied. There were, however, one or two thinkers who took, or tried to take, a different view, and there were glimmerings in their writings that they thought that perhaps leaves might have some use in nature beyond the use of being beautiful objects There were to be found hints in those writings that the leaf had some such purpose, for instance, as to shade and protect the fruit, especially in the case of the grape vine.

But as time went on people began to look on these things in a different way, and the first experiment in botany that was made was performed by a curious old Dutchman, Van Helmont. He planted a willow branch in a pot of earth, which he had carefully weighed. At the end of five years he again weighed the soil and the willow, and found that while the latter had increased from 5lbs. to 169lbs., the earth had only decreased two ounces. He therefore started the theory, which lasted for many years, that a plant grew from what it obtained from water.

An Italian next discovered that if a plant was stripped of its leaves it died, and later a celebrated scientist—Mariotte—proved that plants, in opposition to Van Helmont's idea, did take something from the soil. Then came a very busy period in science—the period of Priestley, Lavoisier, Cavendish, and others. They found out that there was such a gas as oxygen, and Cavendish worked out the composition of water—that it contained hydrogen and oxygen—and then it was generally made known that the air consisted of oxygen and nitrogen, with a little carbon di-oxide. The most interesting point about this busy period to botanists was that the discovery of oxygen was intimately connected with green leaves, for Priestley found that green plants in the sunlight give off oxygen.

Professor Ward then proceeded to consider in detail the structure of a leaf, pointing out that it consisted of a thin sheet supported by tube-rods, so that it might be exposed to the light. He explained the difference between timber trees and plants, such as the tropical lily, which reached a height of over a hundred feet; or a huge plant, a picture of which he showed, which was really a grass growing to a height of 200 feet; or the New Zealand tree fern. The stems of these consisted chiefly of soft fibre from which no timber could possibly be obtained. He further pointed out the action of light on leaves, and gave instances of different forms of leaf characteristic of different climates where the conditions varied.

Next Professor Ward showed diagrams of dissected leaves, and gave a most interesting description of the functions of the chlorophyl corpuscles of the leaf, which form, he said, starch grains out of the water which came to them up the tubes, and the carbon di-oxide, when under the influence of light. If light was removed from the leaf, however, these green corpuscles were unable to perform that office, and Professor Ward proved this by a simple but interesting experiment he made. He had

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placed on a cabbage leaf a stencil plate, in which was cut the letter E. The light was able only to reach that part of the leaf under the plate in the shape of the letter E, and the lecturer, in the presence of the audience, subjected the leaf so experimented on to the iodine test for starch. The result was that the letter E appeared distinctly marked on the leaf in blue, showing the presence of starch in that portion only that the light had been able to reach through the cut stencil-plate. As long as the corpuscles were exposed to the light they formed the starch grains, and these grains fed the plant. Thus plants, by the means of their leaves, made their own food. They, indeed, "made hay (or starch) while the sun shines."

After briefly alluding to the spectrum analysis, Mr. Ward said that it was the red constituent of light which was important to the leaves in their work of starch-forming, and he pointed out that when wood was burnt it simply yielded up the energy the leaves had stored up from the light of the sun, for the solid wood substance was simply converted starch. We as living beings were absolutely dependent for all our food, animal and vegetable, upon this process of the formation of starch, which he had described.

Mr. Ward next showed, by means of a couple of diagrams, that chimneys which poured out acid gases were fatal to this process. One of the diagrams showed some trees in the vicinity of such chimneys in a large town in 1882, when they were beginning to suffer. The second slide was a photograph taken on the same spot six years after, which showed the trees as mere dead skeletons. Professor Ward hoped that more attention would be paid to this, as it was a lesson which ought to be taken to heart. In conclusion, the lecturer showed his audience the fungus which has such fatal effects upon the coffee plant and fungi which attack English fruit trees, and mentioned that the former in fifteen years had, it was computed, done damage to the extent of £1,000,000.

December 1st.—The Right Rev. BISHOP MITCHINSON, on "Plant Distribution in Great Britain."

THE Lecturer said he must apologise for his address before he delivered it. When he prepared it he assumed that he would have to speak to merely the members of the society, a small coterie of persons interested in botany like himself. He was not prepared for a large gathering, or a mixed assembly like that he saw before him, and he feared they would find his address insufferably dull and dry.

He had entitled his lecture "Some Notes on the Distribution of Rare Plants in Britain." Engrossed as he was necessarily with his own professional work, he had consented to go into what could only be for him the bye-paths of hasty recreation, and to speak of observations which would, he feared, appear necessarily superficial to a learned body.

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He confessed at the outset that he had no theory to maintain or even to propose. His facts would land them at no conclusion. In truth, his object was not to air a theory, but simply to set botanists and their like-minded *confréres* speculating, observing and comparing facts on this subject. He proposed that evening to deal only with the *rarœ aves* of British botany—with plants restricted to one locality or to very few, rarities among plants which were utterly puzzling as to how they came in the localities in which they were found, or why each confines itself to that locality, but which were a source of the keenest delight to the botanists who saw them grow in the habitat of their choice.

His first puzzle was the existence of natural botanic gardens in certain favourable spots in Britain. In North Britain there were of the first class—Ben Lawers with the Breadalbane mountains, the Clova mountains in Forfarshire, both of which contained within a very limited geographical area the most astonishing collection of rare plants of all sorts; and of the second class the South-West Corner of Aberdeenshire, West Sutherland, Arran, and perhaps the Lower Hills in Dumfriesshire. In England the best of all these natural botanical gardens was upper Teesdale, then the Craven district of West Yorkshire, North Northumberland, the heart of the Lake district, Snowdonia, and the extremity of the Cornish peninsula. The natural gardens of the second rank in England were Kent and Sussex for orchids, the Surrey Hills, New Forest, the neighbourhood of Cambridge, and perhaps they should add Shropshire—that was the district which lay round the meres. It was astonishing the number of interesting specimens which were found grouped together in these natural botanical gardens. The goddess Flora seemed to have been unequal in the distribution of her favours, and to have acted quite capriciously and on no assignable principle.

The lecturer then proceeded to go into detail, and gave, in somewhat technical language, a very interesting account of his investigations in these botanical gardens and in other spots. He propounded a number of "puzzles" as to the why and wherefore of their existence and locality in the cases of different members of the "*rarœ aves* of botany," as he had promised in his introductory remarks, and in conclusion he spoke of some of the causes which had been assigned as explanatory of the curious facts of the distribution of the rare plants of Britain. Continuity of land in earlier geological time was one cause given—that they were survivals defying the vicissitudes of change of climate and circumstances, but that failed entirely to account for what he called the botanical gardens, or the cluster of rarities round particular centres, or for the bareness of miles of suitable nurseries elsewhere. The winds, too, had been credited with this, and sea currents also had been mentioned which might account for some of the peculiarities. The fourth cause given was the agency of man, but that was to his mind the most insufficient of all. Nature seemed distinctly to set her face against any attempt to introduce aliens and establish them as denizens, and this seemed to be fatal to this theory of human agency. The attempts he

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had made in this direction had in the main proved failures, for his specimens had been overpowered in the struggle for existence by the natural inhabitants of the locality. He thought there was much information on this interesting subject that was still to be desired. In the course of his remarks the bishop referred to the danger of extirpation in which many of the *rarœ aves* of botany stood at the hands of dealers, who cut up every specimen they could find in order that they might make money by the sale of them. He did not fear botanists, but he dreaded these men, and all true lovers of plant nature ought to band themselves by a rigid vow never to purchase any plants from these dealers, but by all means in their power to stamp out the unholy traffic.

December 15th.—HOWARD S. PEARSON on "The Days of Good Queen Anne."

The Lecturer said that under three Queens—Elizabeth, Anne, and Victoria—our country had been prosperous, happy, and powerful, and each Queen had been, in her way, strictly typical of the time in which she lived. As to Elizabeth—heroic, demanding heroism in her subjects, self-sacrificing, determined, positive, domineering, in all things excepting the mere accident of sex a king—there could be no doubt about her fitness to be the pilot of the vessel of the State through stormy seas. With regard to our own Queen, Victoria, born in times which, happily, demanded no such exhibitions of the heroic side of human nature, she was a model of gentle purity, of goodness, and of all the family virtues, and she, too, was equally aptly fitted to typify our own more refined and more intellectual period. Between these two, and about midway between, came Anne, and the question naturally arose in their minds—For what was Anne celebrated, and how is it we look back to her time with so much interest? He must candidly confess that it was impossible to introduce the least element of romance into the life of Good Queen Anne. She was herself 37 years of age at her accession. She had been long married, and she had a husband who had left no trace whatever on the pages of history except for his colossal powers as a drinker. As for Anne herself, she was a good looking, plump, motherly, gossiping, affectionate, dependent sort of woman, well-meaning, but, as had been well said by the Chairman, principally remarkable for being remarkable for nothing at all. But a little reflection would show that Anne was distinctly in her right place, as Elizabeth and Victoria were in theirs. If they had been living in England at that time they would have looked back across almost three centuries of almost incessant struggle. Scarcely had the bloody Wars of the Roses been concluded when Protestants and Roman Catholics arrayed themselves against one another, and no sooner had Protestantism become predominant, than it divided itself into two bodies—the High Church and Puritan, who fought with equal fury. This struggle culminated in civil war. Then came the Puritan supremacy, and then the restoration of license with the restora-

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tion of the Stuart dynasty. Once more came a struggle, and then the Revolution of 1689, and then Anne. And every one in her day knew well it was but a brief breathing time which was accorded to the country, and that the succession to the throne could not be satisfactorily settled without some sort of further conflict. How could they wonder that all that people desired from Anne was that she should live long and do nothing? Not that there was no strife at this time, but it went on far from home. Marlborough's victories were won far from our shores, and the sounds of battle no longer reached English ears. There came a longed-for time of leisure and order, and quiet, settled rule, and they could find traces of that order everywhere, even in the most unusual places. In their costume the people of this country were never more formal, set, or rigid than in those days. Wigs, for instance, were universally worn, because nature's locks were not sufficiently formal. The literature of the time showed a longing, too, for exactitude, formalism, and rule; and religion was stiffer, less elastic, and less spiritual than at almost any other period in our history. Yet no doubt there was a charm in all this, and they were glad to get to a time when everything seemed to be comfortably asleep.

Mr. Pearson then had several portraits of the chief personages of the period thrown on the screen, including the Queen herself, the Duchess of Marlborough, the Duke, and Harley, and he showed photographs of rough engravings of the period, representing the battles of Blenheim and Ramillies, accompanying them all with interesting biographical details or matter of an explanatory nature.

Turning next to the dress of the period, he illustrated it by a number of views, generally remarking that he considered the costume of both sexes to have been more beautiful than that of to-day. Men wore neither trousers nor chimney-pot hats, so that the "crown of creation" was not also the ugliest of God's creatures to look at.

The architecture, the streets of London, the coffee-houses, the newspapers, the everyday life of the people, the education of the period, were all dealt with in a highly interesting manner by the lecturer, and admirably illustrated, and he in conclusion said that the moral he would draw from their glance at the history of this period and of all history was that, while circumstances changed, there was one thing which changed not at all, and that was human nature. He would ask them to remember and never forget that whatever advances they had been able to congratulate themselves on, that whatever happiness and comfort they possessed, unknown in the days of Anne, had come by no process of natural development, or of automatic growth, but had been in every instance the outcome of deliberate and set purpose, of hard labour, and sometimes of blood itself; neither could the advance be maintained without the same persistency of effort and courage of self-devotion. Nowadays the doctrine of original sin was one which met with small favour, but there was a doctrine which no one could controvert—the doctrine of original ignorance. Every child born into this world had

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within him the capacities of something better than anybody they now knew, or of something as bad as anybody they could find in the past. The present improvement in civilization, in comfort, in manners, in order, was an improvement which was the result of hard labour, and it must be maintained by constant care. It was a pleasure to him to spend a few minutes in the service of their Society, which had for its object the spread of education, for it was one of those powers to which they looked for the preservation of all that was most precious in our happy age.

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PRESIDENT'S INAUGURAL ADDRESS.

Ladies and Gentlemen,

By the voice of your Representative Council you have again done me the honour to place me in your Presidential chair; this handsome and historic throne, which has been occupied by some forty of my predecessors, and in which memory recalls so many honoured faces, the choice spirits of the town, nearly half of whom have become to us a memory only. Shaw, Berry, Hollings, Haycroft, Macaulay, Caillard, Picton, Reeve. These are names which cannot die out from the records of Leicester or of this Society, and whom merely to follow is an honour to be proud of. I shall do what in me lies to keep uninjured the reputation of the Society, made by such men as these. Their lives and works illustrate the great truth that the best a man can do for his fellows is to leave a noble memory behind him.

The remembrance of our honoured forefathers, the vision of what man has done and what man may do, stirs even the dullest of us, stimulates heroic souls to endless effort, and helps immensely the general uplifting of the race.

This general uplifting of the race is the subject which I propose to deal with to-night.

The beginnings of the human family are still unknown to us, but such records as we have show us a succession, from the earliest times until now, of groups or races each differing from every other, inhabiting different regions, invading and dispossessing one another, successively attaining power and notoriety and then disappearing, to be succeeded by other races which rise and disappear in the same manner.

The great geographical divisions of the world appear each to have had a human history similar in general outline yet different in detail. In every one of them we find evidence that man's knowledge of the world and power of using its resources were but slight in the earliest times, and continually accumulated as race succeeded race. It is pretty clear that man's mental faculties were the same in the remotest ages as we find them now. He was ingenious, thoughtful, artistic, emotional. The difference between the Cave-men, the rude but masterful Goths and Vikings, and the luxurious Pharaohs of Egypt, is a difference not of kind but of degree; a difference due to varied quantities and proportions of accumulated thought and accumulated sentiment, and of the increase of mental energy which this accumulation implies. The rate at which these accumulations take place is extremely slow at first, but is con-

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tinually accelerating. Probably there is a certain small accumulation of intelligence from generation to generation, even among the lower animals; but in man the powers of speech and of abstract thought immensely facilitate this accumulation, which nevertheless may vary in its rate as much, perhaps, as twenty to one. It may have taken the Cave-men a thousand years to double their stock of knowledge, while the Egyptians may have done as much in a century, and the present nations of Europe and America may be doing it in half that period.

Everywhere the records of humanity proclaim continual change in the direction of development, of knowledge increased in amount and more widely diffused, of the average of intelligence raised, and of sentiment ennobled, made less selfish and more God-like; and throughout the whole course of this development it has proceeded by a succession of waves, of risings and fallings, the highest point reached in each epoch being always higher than in any preceding one. These estimates of high and low must be taken, however, on very broad grounds or they cannot be truly appreciated. In one epoch the chief advance may have been in knowledge, in another in thought, in another in sentiment, but the relics of past civilizations, taken in all their aspects, do assuredly indicate that the early Asiatic forms were over-topped by the Egyptian, Assyrian, and Persian, as these were by the Greek, the Greek by the Roman, and the Roman by the great wave of development now in process throughout Europe and America. We infer from these facts that Humanity as a whole represents one vast wave of organic energy still rising towards some unknown, and at present undiscoverable climacteric; that the various distinct civilizations in their perpetual rise and fall constitute the secondary waves of which the great primary wave is composed; that the civilizations of the present day are in their ascending phases, still developing and growing nobler; and that the progress of each race-wave depends upon the uplifting of each individual of which that race consists. The individual is the fundamental unity. All development of races, of civilizations, of humanity itself, rests upon the growth of the individual souls. It is through the conscious individual only that energy is accumulated and mental power expanded. If any of us are inspired with a generous yearning to help forward the progress of Humanity, the means lie always close about us. It can only be accomplished by increasing the knowledge, widening the mental outlook, and developing the higher emotions of as many individuals as we can reach. There is one word in the English language which expresses all that can be done and all that need be done to bring out the utmost possibilities of the human race. That word is *Culture*. Not the pedantic culture which, according to the quotation of Matthew Arnold, John Bright once contemptuously described as "a smattering of the two dead languages, Greek and Latin," and Frederic Harrison spoke of as "the silliest cant of the day." Whatever was thus characterised by two such vigorous-minded men was, we may be sure, of not much value. At that period Plato was forgotten; Utopias were out of date; it was a

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hard-headed practical time. What went by the name of Culture was the product of the old-fashioned public school, and that product unreformed and lifeless was not much in demand.

Matthew Arnold fought nobly for a higher interpretation of culture, and his work was not without effect. But his vision of it was from the literary critic's point of view, and does not seem to me to be quite as definite, as complete, and as philosophical, as it might have been if he had regarded it more scientifically. He describes culture, indeed, as "a study of harmonious perfection, which consists in becoming something rather than in having something; in an inward condition of the mind and spirit, not in an outward set of circumstances," and this definition is elevated and not altogether inadequate. But in working out this theme he seems to forget that man is a many-sided being, that he has a physical as well as a spiritual life, and that what we call his lower passions and his earthly nature are part and parcel of him, and must be regarded in any scheme of culture which aims at the harmonious perfection of humanity.

True culture has no special connection with dead languages, and is the very antithesis of "silly cant." Everything pedantic, one-sided, prejudiced, narrow, mean or unmanly, is utterly outside the ideal manhood. A woman whose mental condition is such as to justify the nickname of "blue stocking," is not a cultivated woman.

In the vegetable world there is no more lovely object than a well-grown Horse-chestnut tree in full bloom. The stately trunk, massive and sinewy as Atlas, rises from the earth with a gigantic grace. The great branches, full of power below, divide tenderly where the extremities turn towards heaven, and bear up the rich green billows of foliage, infinitely varied in form and tint. And then the exquisite spires of white and pink, each in itself a marvel of beauty, light up the green cloud like fairy torches. What grander object can the wide world show? But if it were all white spires without the green, or a mere mass of leaves, or all bare arms with stunted foliage, we should call it a distorted and ruined tree, and that forester an incapable ass who pruned and reared it to such ruin. Is it not so with man or woman? It is possible to produce a semi-vigorous intellect even in a puny body, or a magnificent physique with an empty brain-pan. There are men who can think, but cannot buy and sell; others who can make shrewd bargains but don't know a triangle from a rhombus. These are all uncultured people, who have grown up anyhow, chaotically, like wild weeds. They may have laboured at their books for years and taken leading honours; they may be wonderful athletes whose achievements beat all records; they may be silver kings or nitrate kings with polished manners and all society at their heels, but they are barbarians nevertheless, whose education has been neglected. The harmonious perfection of humanity means much more than these have dreamed of. What *does* it mean? It means that man at his best must not be outdone by a chestnut tree; that his trunk, his limbs, his foliage and his blossom

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must all be strong, vigorous, well-nourished, and beautiful. It means that every physical function must be healthily and actively alive; that every sense must be trained and practised to its utmost capacity; that the intellect must be accustomed to deal with the whole round of sense-perceptions, to recognise and correlate the abstract ideas arising from such perceptions—that is to reason, to imagine, to argue and form judgments; that the emotions must be developed in due sequence, each in its place and proportion, and the whole commanded by those imperial emotions of admiration for Beauty and reverence for Right, which crown the temple of humanity and form the keystone to its harmonious perfection. The ideal manhood is unattainable except by complete and all-round culture, the development of every capacity, physical and mental, in due proportion. For the intensity of the *highest emotions* is dependent on the vividness and frequent presence of the abstract ideas of Beauty and Right. The vividness and frequency of these ideas depends upon the number, the variety, and the forcefulness of the concrete ideas which result from sense-impressions; while the current of sense-impressions depends upon the work done by the physical organs. Thus the whole nature of man is shown to be a unity, a building of which each story rests upon the one below, and which can never lift its crowning dome into the air of heaven unless each course is firmly and wisely laid from the very foundation upwards. A healthy physique is an absolute necessity. The stream of sense-impressions cannot be full and rich and varied unless there is physical energy and perpetual practice of every limb and every organ.

A cultured man needs to see and hear and know everything that is to be seen or heard within his reach. He needs to have some acquaintance with all the realms of Nature and all the processes of Art. To know how tools are made and handled, and what they can do; to know how property is acquired and dealt with; how social life has grown to its present complexity; how nations are governed; how commerce is conducted, and how fleets and armies are managed for its protection. There is no science whose rudiments can be spared out of his mental library, no language of which he can afford to be quite ignorant. With the senses pouring into his consciousness a torrent of concrete ideas, if his brain is as healthy as his limbs and as well trained, these will be rapidly assimilated by the reflective consciousness which will produce from that material its natural crop of *abstract* ideas—ideas of space and time, of magnitude, sequence and quality; intellectual conceptions of all kinds; classification and logic; mathematical calculation; moral judgment; with the abstract ideas of character, such as courage, charity, modesty, virtue, and their contraries; and above them all the ideas of Beauty and of Rightness.

This tremendous mental commotion of abstract thought will find its ultimate outlet in stirring up a host of emotions. It is in these emotions that the spiritual energy of man has its last and loftiest expression. If the emotional nature has been wisely trained and cultured the emotions

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displayed will be harmonious and lovely, with the admiration for Beauty and the reverence for Right leading, guiding, and ennobling the whole. The outcome of emotion is action. Good deeds, good words, brave, modest, helpful, kindly work for others: this is the mighty river channel which pours back upon the outside world the surplus energy which has been drawn into the vortex of an individual life, and some of which has gone to the building up of that individual force-wave whose activity we do not believe will cease when its earthly phase is ended.

So far we have been theorising, and our grandfathers would have pooh-poohed theory and advised a resolute persistence in accepted ruts. But we have been slowly learning during the last half century that, in the long run, rule of thumb cannot hold its own against rule of law; that the most effective practice is that which guides itself by a well-comprehended theory.

Having defined the objects of culture as the harmonious development of the whole of our natural capacities, physical and mental, let us now consider by what processes that object may be best attained. First, the physique; second, the sense-impressions; third, the reasoning intellect; fourth, the emotions. These are the four main lines in the development of every human soul, the four great secondary force-waves, which, starting together at birth, unfold with different velocities, reaching their climacterics in succession, and always in this order. The first practical work in the ark of Culture is to make sure of a sound, healthy, well-strung and well-balanced physique. To this end food, clothing, ablutions, air and exercise have to be wisely considered and administered. The infant must be neither coddled nor recklessly exposed. The child must live out of doors as much as possible. Out-door schools in the summer, and large, airy, well-ventilated school-rooms in the winter, are essential. There are several important matters in which modern education distinctly fails in the cultivation of the physique. Dentistry is an art for which there ought to be but little need. White bread, hot drinks, too much sugar, and not enough gnawing of bones, are probably among them accountable for the condition of modern teeth. The difficulty is for any parents to get sufficiently out of the ruts of social habits to keep clear of these injurious practices. White bread is easy to get, good brown bread is difficult. Everybody drinks hot tea, and so the children get it. Sweet-shops swarm everywhere, tempting the children to excess. It is a rule of society that bones must not be touched with the fingers; how can we encourage our little ones to gnaw them? There is no escape except by resolute determination to spare no pains and to yield to no conventions in the effort to secure whole and healthy bodies. The habits of society on these points must be altered, and when we are sufficiently convinced of the necessity they *will* be altered.

Great has been the apotheosis of soap! Was ever anything so absurdly belauded, advertised, and crammed down the throats of a miserable people as soap—except mustard? Cleanliness may be next to Godliness—though the Bible doesn't say so—but it is one thing to be clean, and

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another to be excoriated. Nature puts a delicate oil upon the skin to keep it soft and supple; the perpetual soaping of all parts of the body removes this, and the functions of the skin are disorganised.

In the exercise which is prescribed for youth, mere *games* have too large a share. Cricket, football, tennis, golf, may have their appropriate uses, but we cannot afford to waste so much time upon them. The training of limbs and muscles and senses, which they undoubtedly effect, can be got equally well in pursuits which at the same time give exercise and training to the intellect. The young geologist who climbs mountains and scales cliffs with his hammer in his hand; the cyclist who uses his machine, not for covering so many miles in so many minutes, but for visiting distant or out-of-the-way places, where there is always something to be learnt; the swimmer or the oarsman who acquire a valuable art; each gets a physical training equal to that of any game with a useful result at the end of it. The tendency of society is always to run in ruts. It is our duty as members of a Literary and Philosophical Society to recall it to the paths of moderation and wisdom. All these games are good, and a thoroughly cultured man should have some experience of each, but to be able to climb a cliff or ride a cycle is a more useful acquirement than to know how bats are handled or wickets kept, and swimming or rowing may be regarded as essentials in the education of every Englishman.

The most important period for the training of the body is of course that period during which it is being permanently built up. The body comes to its maturity long before the mind. If it has not been fairly developed in the first twenty years of life there is little hope for it afterwards, and the real foundations of the permanent physique are laid down during the first ten or twelve years. During these first twelve years the only part of the intellect which is growing rapidly is that which takes cognizance of sense-impressions. Abstract thought is still in a quite embryonic stage, and no efforts should be made to force it forward. Schools for children up to the age of twelve should be devoted to the training of the body and the senses. Leave abstract thought alone. The attempt to cram into those budding minds the rules of grammar or the principles of mathematics, is an unnatural waste of time. It is thoughtless teaching of this type which leads to those absurd school-boy answers, showing how words have taken the place of ideas, which have recently amused society, but which are, in reality, too sad for mirth. We need to appreciate so highly the value of Culture, and the preciousness of every hour of time that we should be indignant rather than amused at these evidences of incapacity in the teacher. The Kindergarten system is a right beginning. We want the same principle expanding for nearly all children up to twelve years of age. To learn the forms, colours, textures, and names of things; the actual structure of the earth and its organisms; the uses of tools and machinery; the correct use of language, and the simplest properties of numbers; these, in addition to the physical training of hand and eye, of nerve and

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muscle, may well occupy the early years of school life, without going below the surface into questions of why such things are, or how they came to be so, which properly belong to a later stage in mental development. How many children of twelve years old at the present time could distinguish by sight and by name as many as twenty colours? or twenty mathematical forms? or twenty different woven fabrics? How many know the hundred common garden weeds by sight and name? or a dozen butterflies? or a score of birds? How many can use a saw or a plane, or even a screw-driver? Yet these facts and these practical habits are the true foundations of Culture, and to build the upper stories until these foundations are completed is barbarous and stupid work, which must inevitably betray its weakness under the pressure of after life.

In this inquiry we have to remember that as in a forest of a million trees, though they be every one of the same species, there can never be found two leaves which are absolute counterparts of each other, so in the thousands of millions of human souls which are and have been on the surface of this planet, every one is a distinct individuality, a unique fraction of the universe, which cannot be imitated and of which there is no copy. With the possible exception of the elemental atoms and molecules (if there are such things), Nature never repeats herself, never makes two things alike. The elements of humanity are so numerous that their possible combinations are inexpressible. Practically we know, and theoretically it can be proved, that every human being differs from every other. Yet these differences are all included within the limits which define a man from a brute on the one side, or an angel on the other. In consequence of this unity the same general laws of culture may be applied to all human beings, while this infinite variety precludes all fear of producing a dead monotony. Culture is an artificial process, yet not entirely artificial. Does not Nature cultivate the great garden of the world? She sows her seed, manures her soil, tills it with the sharp tooling of the frost, waters the young plants with the showers of Spring, and ripens her fruit by the dry heat of Autumn. For her crop of living animals she makes the plants store up abundant surplus food in roots and seeds, she scatters brooks and pools over the pasture lands, and makes caves and forests for their shelter, and for the peculiar culture which man needs she gives him no weapons nor natural clothing, makes food and shelter and enjoyment dependent on the budding intellect, and slowly teaches him to regulate his social passions, and to lift his best hopes into that spiritual domain which is his special sphere.

All man's utilitarian Arts arise from his perception of the lines on which Nature is working, and of the possibility and desirability of expediting and enlarging her work by his assistance. She scatters food plants up and down, he collects them round his dwelling. She makes them largest and sweetest in the richest soil, he observes this and prepares his soil so that they may *all* be large and sweet. She gives him caves for shelter and trees for shade; he learns to put wood and stone together into more convenient forms. She floats fallen trees along her

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rivers, he hollows them into boats, and gradually develops this rough suggestion into fleets of steamships. The art of human culture is in the same way a development of Nature's work. She sets the human race upon this earth as children in a school—a rough-and-ready school, after her natural fashion, but effective in the long run. His body is braced and his mind unfolded by her rigorous teaching, and the best thing she does for him is to make him see at last how he can help himself by carrying out her system more systematically. Then he starts schools of his own, and as he gets a broader and deeper insight into his own physical and mental structure, as his notions of the ideal man continually grow loftier, he improves his schools, enlarges their curriculum, and perfects their methods. Yet seen from the standpoint of his little life, his progress seems immensely slow. Probably for a hundred thousand years he has been learning the art of Culture, yet much of his machinery is still barbarous and out of date It is of the nature of forms and methods to stand still, to crystallize and become permanent, while it is of the nature of thought to move on. Always, therefore, the forms are behind the thought, and need periodical and pretty frequent revision.

Let us then return to the practical question, what is demanded by the ideals of the present day? We are a conservative people even in radical Leicester, and hold to our ancient customs with tenacious grip. It may, indeed, often be a wise conservatism, not to let the old plan go until we distinctly see the better plan to put in its place, but our conventional systems of education are in some points so plainly unscientific, wasteful, and illusory that we ought to insist upon a more natural system. The light is dawning. All good schools are slowly feeling their way in the right direction. The wonder is that progress is not more rapid, that they are not bold enough and strong enough to do the right thing at once. But the schools are hardly to blame. The actual block is at head-quarters. The universities fix the standard, and the Education Department of the Government make their Code on university lines. While honours depend upon the early forcing of abstract thought, the schools must sacrifice scientific method to conventional requirements. But if boys and girls at twelve years old were thoroughly conversant with all the objects around them, were practised in the art of comparison, furnished in memory with a full vocabulary of which every word represented a well-known thing, had all their senses cultured and acute, and all their limbs so under command that they could practically do whatever they desired, what would it matter though they knew nothing of the rules of grammar, or the religion of the Druids, or the conjugation of a Latin verb? These things are a necessary part of culture, but not of culture at twelve years old. Somewhere about that period of life, however, the third great wave of vital energy begins to emerge from the embryonic stage. Wonderings and questionings arise in the mind. The boy reflects upon his own nature, asks himself what life is, what God is, what is the meaning of the world, of history, and Religion, and the Rule of Three? He wants to get at the bottom of things, to find out the Why

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and the How. He has, of course, asked many puzzling questions long before, and if he is a precocious lad, this development of abstract thinking may have occurred two or three years earlier, but on the average it does not come into prominence before the twelfth year of life. Now, then, he is prepared for the higher culture, will enter upon it *con amore*, will delight in this new field of study, and make more progress in twelve months than would have been possible in any five years before. And what a field it is that unfolds gradually before the thinking soul! A region of existence open to man alone of all the inhabitants of earth. This is man's special and characteristic capacity to look beyond the things that are, to those that have been and those that shall be, and to recognise the inevitable laws of energy which connect the past, the present, and the future; to get behind the senses; to use them merely as stepping-stones across the river of time into that land of abstract thought in which time and space disappear; to be conscious not only of forms, colours and textures, but of the perceiving eye; to be *self*-conscious; able to look into the working of the conscious mind and analyse its processes; able to see that the region of abstract intellect rises sphere above sphere, beyond even man's present capacity of thought, to what, as far as we can tell, may be infinity.

If it is necessary that a boy should leave school at twelve and begin to earn his living, he will not be better prepared for that career by any smattering of Latin Grammar, or Euclid, and time spent upon those things will have been wasted. The kind of culture which is scientifically adapted to that period of life will be found practically the most useful to boys or girls who must enter upon practical work at that age. A wide familiarity with facts and things; practice in the use of the limbs, the senses, and the tongue: good writing and drawing; clear pronunciation; freedom from vulgar and careless provincialism, either in speech or manner; readiness in dealing with simple figures; and ability to read and speak in several languages—a knowledge, in fact, of the three R's, supplemented by the equally important knowledge of substances, places, tools, and machinery, and of such useful exercises as swimming, riding, and climbing; these are the arms which should be furnished to the young soldiers of civilization who have to fight in the first line; and if their whole time were given to these objects a fair equipment might be provided by the age of twelve.

From the primary schools, those pupils who can afford the time should pass to the secondary schools or colleges. Here the whole attention should be given to abstract thought. The laws and principles underlying the facts with which they are already acquainted will be unfolded to them. They will be encouraged to think out every subject for themselves, to accept as little as possible at second hand, to correlate the principles of all branches of learning, so as to get as near as may be to the fundamental unity, and to observe and comprehend the relations of the abstract laws to the concrete facts. Grammar, Science, History, and Mathematics, the study of these first in broad outline, and later in

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detail, will form the early curriculum, and in the finishing years will be introduced Logic, Æsthetics, and Ethics, founded upon those ultimate abstractions, Truth, Beauty, and Right.

By the age of seventeen every boy and girl should have gone through the whole college system and be prepared for any special study, or any practical occupation, with a thoroughness which is rarely found under existing conditions. To keep a boy at school or college beyond the age of seventeen, when he is destined to face the world in any form of commercial life, is a practical blunder. After that age the habits of mind and conduct begin to crystallise; suppleness and teachableness are disappearing; the young man will never properly mould himself to his work unless he is put in harness before this crystallisation sets in.

But there is another phase of school life to which we have scarcely yet referred; the culture not only of the limbs, the senses, and the intellect, but also of the desires and emotions. The desires are those longings to draw towards oneself whatever will satisfy the wants of the body, or give pleasure to the senses or the passions. The emotions are those outgoings of the human spirit towards what is seen to be beautiful or good, those movements of the self towards others which are among the noblest elements of human character. Desires are self-regarding, emotions self-forgetting. In actual life these two mental states are often so blended that it is difficult to unravel the true motive of action, but these are the forces to which action is primarily due. Both these forces need culture to develop them in their best strength and best proportion. Both are good, but both are open to abuse, especially the desires. The lower animals have desires in full strength, but only faint traces of emotion. Man's desires connect him with the animals, his large capacity for emotion lifts him above their level, into his own unique position. Desires are roused chiefly by the concrete ideas arising from sense impressions, emotions by the abstract ideas of the intellect. Hence, in the early stages of education, while the body and the senses are under training, the self-regarding desires need also to be carefully guided. Not by a too austere repression. They will rarely yield to this. But rather by example, by gentle authority, by the *habits* of obedience and self-restraint. The ultimate and most powerful checks upon these self-regarding desires are the self-forgetting emotions, but as these do not come into full play till a later phase of development, some exercise of authority, and some practice of obedience are required in early life. In the curriculum of the secondary schools or colleges authority ought to be scarcely needed. Here the emotions of curiosity, admiration, and reverence should gradually take full control of the student's conduct, leading him naturally to earnest labour in pursuit of the true, the beautiful, and the good. In most of the colleges of the present day not much attempt is made to cultivate the recognition of beauty, and the emotion of admiration, nor to inspire the student with that reverence for Right which is the common element in all religions. The higher education, as now conducted, fails conspicuously on both

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these points. Most young men, who are supposed to have received the best culture of the day, have little interest in the beauty either of Nature or Art. To them the chief value of flowers is to make button-holes, of birds to furnish sport. Day is for guns and dogs; night for cigars and card parties, but not one hour for the beauty of form, colour, and tone, with which this world is flooded. Pictures and statuary are valued at their worth in gold; who cares for the beauty if the thing will sell? But what a vandal is that man who values pictures thus! who buys them merely for speculation, looking for those effects which a vandalised public will run after and pay for! and bribing artists to their ruin.

The *raison d'êtres* of Fine Art is to make permanent the fleeting phases of beauty which nature sets before us hourly and everywhere, but is perpetually destroying and changing; phases of beauty not only in the physical world but in human character and conduct. The artist who fixes for us on canvas or in marble these subtlest products of creation, takes rank among the noblest benefactors of mankind, but the higher the possibilities the deeper the degradation when those possibilities are forgotten or sacrificed. That is no true culture which leaves the perception and enjoyment of Beauty to grow hap-hazard, as a weed, uncared for.

But our present college training often fails as completely on the ethical as on the artistic side. How much reverence for the Right have young fellows who find their amusement in betting and gambling? who are accustomed to the selfish and reckless play of the football field? or the mean vanities of mashing and flirting? No wonder that civilised life is disgraced by bubble companies, by cornering syndicates, by jobbery and bribery of every kind, when the essential principle of all conscientious conduct is almost ignored as part of a young man's college training. Would books like Ovid's *Ars Amatoria*, or Lemprière's Classical Dictionary be put into the hands of boys if the teachers thought it part of their duty to cultivate the recognition of, and the reverence for, pure Rightness? These vile books are happily becoming obsolete, but they are not yet extinct, and the mischief they have done cannot be calculated. It is true that in most schools of any repute there is cultivated a sense of school-boy honour; and this is something, but it is not much. School-boy honour is not generally founded upon the highest motive. The question is too frequently, what will my class-mates think of me? rather than what is it Right to do? and the practical result is, often, that much actual wrong is done. Rather than be branded as a "tell-tale," many a school-boy will suffer wickedness to be perpetrated in his presence, and feel himself justified by the code of honour. We want a higher code than this. We want our boys to be taught that right conduct can only be founded upon right feeling. We want the outlook of their minds to be so constantly led towards the idea of Rightness, that they shall be quick to recognise it under all conditions; and we want them to be so inspired by the books they read, and the social

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atmosphere they breathe, that the emotion of reverence for the Right shall leap up, warm and masterful as it ought to be, at every vision of that loftiest idea. The books of history which are put into their hands should never make exciting romances out of wars, and quarrels, and massacres. The facts must be told, and the noble qualities of brave soldiers must be worthily honoured; but the selfish wickedness which makes such things possible should be so exposed as to make the whole narrative sad and repulsive, and such narratives should in all cases be reduced to the minimum. We want the Heroes of true Rightness to be made the prominent features of history. We want to see the gradual progress and development of the human race under the influence of the never-failing succession of martyrs and prophets, brought out in all the wonderful beauty of that great fact, with all the brilliancy of literary style, and all the inspiring fervour of poetry.

The ideal of true manhood and true womanhood has undoubtedly been advancing during the last half century in the minds of the leaders of thought and of social conduct, and the average culture of civilised nations has advanced in a still more marked degree; but there are still phases of social life which seem to be untouched by any civilising influences. The passion for gambling; the eager pursuit of sport in all its forms; the rage for the wildest sensationalism in novel, poetry, and drama—these are characteristics of modern life which are neither noble nor lovely. They are outbursts of selfish desires, dissipating the energy which might be led up to a higher level and find its expression in the unselfish emotions. They are evidences of low culture; of some failure in our social system which suffers such barbarism to make such headway among the people. One cause of these barbarous outbursts is to be found in the low culture of two classes of society from whom better things might well be expected. These two classes are the upper ten thousand, who set the fashions; and the proprietors of the periodical press, who cannot resist the temptation of making money by fostering that which, if it is not vice, is certainly not virtue. In both these classes there are many noble examples of the truest culture and the manliest conduct, but they are not yet numerous enough nor strong enough to make gambling and sport vulgar, nor to put down sensationalism by the higher interest of nobler art. The pessimist, glancing over the surface of society, and seeing these prominent and glaring blots upon its beauty, casts up his eyes in pious despair, or else laughs at the notion that any good Providence can rule over such a God-forsaken world. But the pessimist is surely wrong. The progress of Humanity is a series of oscillations. Heaven is not taken by storm. It is not reached by the leap of the fiery rocket, but by the spiral pathway of the singing lark. The popular blunders, the coarse customs, the fashionable vices of each period do but mark the outmost curve on either side, the furthest swing of the pendulum. It will come back again, and swing nearly as far on the other side; not quite. These oscillations grow less violent from age to age. The coarse customs are less coarse, the fashion-

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able vices are not so gross as in earlier times. We are slowly oscillating into a purer, loftier life; slowly climbing up the spiral stair with the morning lark-song always above us, and Heaven's gate nearer to us by every onward step. Pessimism is a helpless, hopeless, unpractical creed. No doubt the world would go on its way, and man would fulfil his destiny though we were all pessimists together. But Nature would lose the help which may be rendered to her by man's conscious Art, for to the eye of the pessimist the world is not worth helping, and human progress and development would be so much the slower. It is the hopeful and optimistic spirit which puts its hand to the plough and gives its best aid to all progressive influences. Believing in the universal brotherhood and the great possibilities of the human race, we gladly make some personal sacrifice in order to help forward the general culture. To this optimistic spirit, dominating our present civilisation, its comparatively rapid progress is largely due. One of its most striking and unique features is the desperate effort which is made by a great variety of methods, to raise the general level of culture. Hospitals of every kind look after all manner of physical ailments; school systems are invented for the purpose of giving every child that is born the elements of mental development. The universities are sending out intellectual missionaries in all directions. Everywhere are springing up public libraries, museums, art galleries, and schools of art. Dramatic art never was so popular, and as to literature, the world is literally flooded with it. What is most wanted now is a more complete conception of the ideal culture, at which we are aiming. The common notion of what a respectable citizen should be is not high enough, and the methods employed to produce even that inferior article are not sufficiently scientific. Differences of natural capacity will, perhaps always, certainly for many years to come, divide society into classes; and among these classes there will be different degrees of recognised rank and influence. One of our principal aims should be to make the culture of the top rank as perfect as possible. That rank or class of society will necessarily stand out as an example to all the rest. It will be the standard by which others will be measured, and which they will generally imitate. The topmost social class, as it exists now—the Upper Ten—is a heterogeneous crowd containing some of the finest and most truly cultured men and women in the whole world, mixed with a much larger number of whom some have money and manners, but few brains; some money and brains, but no manners; some brains and manners, but little money; some money only; some brains only; and some nothing worth speaking of except manners. The example which it offers is a very indifferent one, but its influence is great, and the common social tone is largely due to it. The general level of culture cannot be high until this class is either improved or supplanted. It is possible to improve it gradually by making social honours more dependent upon high character and less upon birth or possessions, or even intellectual capacity alone.

But while we are doing our best to raise the standard of the typical

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class, we must spare no effort to perfect our methods of culture in all other classes, and to carry them out from the beginning on scientific principles. We want our people to be rich in all the highest characteristics of mental life; to have the self-forgetting emotions strong and ardent, the intellect stored with knowledge and capable of profound and long-continued thought, the perceptions quick, delicate, and well trained—and then, remembering the "tremendous cost of nerve-tissue," the great expenditure of energy in all mental activity, we must have the physical system, by which energy is supplied, kept in such perfect order that the mental requirements can be always amply met. To bring about this harmonious perfection in every individual we must have the young soul fully equipped, and the lines of his development firmly fixed by the age of seventeen, and to accomplish so much in those few years, every hour must be made the most of. Under the present system the waste of time is enormous. Boys and girls fritter away the precious moments in all manner of useless pastimes. Books are written and read which have no helpful influence. Art is too exclusively technical, and forgets its great mission. The general school system is not half organised, so that much of the pupil's time is dribbled away by experimental processes, by differences in the schemes of successive schools, or the methods of successive teachers, by imperfect organisation of classes, so that twenty are kept waiting by the dulness of one, and by a score of other leakages which probably make up together not less than an average of 20 per cent. of the school day. This waste of time is due to want of knowledge and want of organisation, and among all the possible benefits which wise and thoughtful men might bestow upon their race, none would be greater than the careful working out in full detail of the most effective and economical system for training up young men and women from infancy to adolescence, so as to produce the completest possible development of all their physical and mental capacities; without over-pressure, without one-sidedness, without clouding the joy of life or crushing the light-heartedness of youth, yet giving to every soul that true education, that drawing out of the best that is in it, that harmonious perfection of humanity which is the synonym of Culture.

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THE ELIZABETHAN PLAY-HOUSES.

By A. H. Paget. (Read before Section "A.")

About three years ago, at a meeting of this Section, I ventured to criticize the ending of some of Shakespeare's tragedies. I thought that too much was often said in winding up the stories; that Shakespeare lacked a certain reticence which guides modern writers to finish directly the catastrophe occurs; and, at all risks, to avoid prolixity or anticlimax. On thinking further, a practical reason for Shakespeare's method offered itself. Almost all the plays end with an empty stage. Does not this go to show that there was no other possible way of withdrawing the characters from view—that is to say, that there was no curtain in front of the stage? Then, if there was no other way of withdrawing the characters from view, Shakespeare was compelled to let them talk, till he could devise for them a dramatic exit with which to end. So far I advanced in my Paper, as printed in the Transactions of January, 1888. But I then only touched the fringe of an enquiry. If there was no curtain to end the plays, there was none to rise when they began; nor one to rise and fall, or open and close, for each act and scene, as well as entire play.

I consulted some literary friends; and, finding by letters from Prof. Dowden, the late Mr. Halliwell Phillipps, and Mr. William Archer, that the enquiry seemed worth following, I continued on the track. The present Paper is a slight contribution towards clearing up a question, upon which, so far as I know, little has yet been said. The matter is of some interest, not merely as a point of stage archæology, but also as an attempt to realize the conditions under which the Elizabethan dramatists wrote.

At the outset it is well to give "a local habitation and a name" to some of the chief playhouses with which Shakespeare was personally connected. The facts are gathered from Mr. Halliwell-Phillipps's "Outlines of the Life of Shakespeare."

The earliest playhouse in London, specially built, or regularly used, for dramatic purposes, was called the Theatre. In 1576, James Burbage, by trade a joiner, and then a leading member of the Earl of Leicester's players, leased some property lying between Finsbury Fields and Shoreditch, and formerly part of the Priory of Holywell, suppressed by Henry VIII. There he built the Theatre. We know the house was opened by August, 1577, because Burbage was then ordered to close during prevalent sickness. This playhouse was quite in the country. A writer in 1584 speaks of the "gorgeous playing places erected in the

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fieldes." Another, in 1599, speaks of gentlemen "riding into the fieldes, playes to behold." A botanist, in 1597, recorded a certain plant he found "walking in the field next unto the Theatre by London."

The Curtain playhouse almost immediately sprang up very near to the Theatre. This, too, was built on the old Priory Estate, with the object of being more or less free from the jurisdiction of the City. It took its name from a close, or portion of the premises, then, and for a long time past, known as the "Curtain." Mention occurs of this house before the close of 1577. The same company seem then to have used both the Theatre and Curtain. The Curtain probably remained long after the Theatre came to an end under the following circumstances.

James Burbage died in 1597. By his lease of the Theatre property he was empowered in certain events to "take downe and carrie awaie to his and their owne proper use all such buildings and other things as should be builded, erected or sett up." The lease expired the very year Burbage died, and difficulties arose as to its renewal. And that was not all. In July of that same year—1597—the Privy Council directed the Justices of Middlesex to suppress the Theatre and Curtain, and "forthwith to plucke downe quite the stages, galleries and roomes that are made for the people to stand in." It was clearly time to be off. Burbage's sons, Cuthbert, and Richard Burbage, the great tragedian, now took prompt action. They agreed with Peter Street, a builder and carpenter, to remove the woodwork and timber of the Theatre to the Bankside, in Southwark; and so proved too quick for either the Justices or the landlord, who had his own designs on the building materials. With Street's help the lessees brought away their materials in December, 1597, or January, 1598.

Mr. Halliwell-Phillipps writes:—"Little is known respecting the dimensions and structure of either the Theatre or the Curtain." Although both were used in winter, "there can be little doubt," he says, "that the roof in each of these buildings merely covered the stage and galleries, of which there were two, the pit or yard being open to the sky."

For many years, he continues, these two were the only regular theatres in England. Various playhouses occasionally referred to were only inn yards, where plays were sometimes acted: as the Cross Keys, in Gracechurch Street, the Bull, in Bishopgate Street, and the Belle Savage, on Ludgate Hill.

The Globe Theatre was built in Maiden Lane, on the Bankside, and, as we have seen, partly with materials brought from Shoreditch. It was opened early in 1600. This playhouse, says Mr. Halliwell-Phillipps, appears in a contemporary sketch of the exterior to have had "a circular sub-structure of considerable size, perhaps constructed of brick or masonry, which probably included a corridor with a passage to the pit or yard and staircases leading to other parts of the house. Upon this sub-structure the two wooden stories, in

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portions of which were included the galleries and boxes, were erected. The building was constructed mainly of wood, and was partially roofed with thatch, but the larger portion of the interior was open to the sky." The Globe was burnt in June, 1613, and was opened after rebuilding early in 1614. This later Globe seems to have been used chiefly as a summer theatre, and probably continued until the Civil Wars.

In January, 1599-1600, Peter Street, who had already removed the Theatre to Bankside, contracted with Philip Henslowe and Edward Alleyne, the founder of Dulwich College, to build the Fortune Playhouse, near Golden Lane, in St. Giles, Cripplegate. The specification is preserved at Dulwich. For various particulars of construction it contains reference to "the late erected plaie-house on the Banck * * * called the Globe." It was to have "a stadge and tyreing house * * * with a shadowe or cover over the saide stadge * * * and which stadge shall contein in length fortie and three feete of lawfull assize, and in breadth to extende to the middle of the yarde of the saide house, the saide stadge to be paled in belowe with good stronge and sufficyent newe oken bourdes * * * with convenient windowes and lightes glazed to the saide tyreing-howse." The floors were to be of "newe deale bourdes of the whole thicknes." The description tends to show that the roof over the stage sloped downwards from the front, so as to drain to the back.

Payne-Collier states that the Fortune was burnt to the ground, with all contents, in December, 1621, and that it was rebuilt in 1623.

In February, 1596, James Burbage, the founder of the Theatre, bought part of a large house in the Blackfriars, which was afterwards converted by him into a playhouse. This was the second time he had planted himself in old ecclesiastical haunts, in order to be as free as possible from the hostile supervision of the City. Thereupon certain inhabitants of the Blackfriars precinct petitioned the Privy Council that "no playhouse might be used or kept there." But the scheme seems to have been put into execution then, or soon afterwards. In June, 1600, the Privy Council directed that there should be only two playhouses—namely, the Globe and the Fortune; the latter being instead of the Curtain, which they had lately ordered to be "plucked downe." In December, 1601, the Council found that their mandate had not received attention from the Justices, and the injunction was repeated. In April, 1604, a gentler tone prevailed; and the Council desired the Justices to sanction performances at the Globe, the Fortune, and the Curtain, the Blackfriars not being named, and therefore probably not yet opened, or not occupied by an adult company. The Blackfriars playhouse comes again into notice in January, 1618-19, when the Corporation ordered its suppression. It states that "the owner of the said playhouse within the Blackfryers, under the name of a private house, hath converted the same to a publique playhouse"; and this had caused complaints by reason of the large concourse brought together.

Mr. Halliwell-Phillipps prints a series of most important documents

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which were discovered, as Mr. J. F. Furnivall writes, by the former gentleman in 1870. From these we learn much of the early history of the stage. In 1635 certain actors engaged at the Globe and Blackfriars petitioned the Lord Chamberlain to get them admitted as shareholders of these theatres; their petition was granted July 12th. These same men then made further demand for sharing privileges, whereupon the existing shareholders made a counter statement, showing reason why the prayer of the petitioners should not be granted. They urge that—

"The father of us, Cuthbert and Richard Burbage, was the first builder of playhowses, and was himselfe in his younger yeeres a player. The Theater he built with many hundred poundes taken up at interest. The players that lived in those first times had onely the profitts arising from the doores, but now the players receave all the commings in at the doores to themselves, and halfe the galleries from the houskeepers. Hee built this house upon leased ground, by which meanes the landlord and hee had a greate suite in law, and, by his death, the like troubles fell on us, his sonnes; wee then bethought us of altering from thence, and at like expence built the Globe, with more summes of money taken up at interest, which lay heavy on us many yeeres; and to ourselves wee joyned those deserveing men, Shakspere, Hemings, Condall, Philips, and others, partners in the profittes of that they call the House. * * * Thus, Right Honorable, as concerning the Globe, where wee ourselves are but lesses. Now for the Blackfriers, that is our inheritance; our father purchased it at extreame rates, and made it into a playhouse, with great charge and troble; which after was leased out to one Evans, that first sett up the boyes commonly called the Queene's Majesties Children of the Chappell. In processe of time, the boyes growing up to be men, which were Underwood, Field, Ostler, and were taken to strengthen the King's service; and the more to strengthen the service, the boyes dayly wearing out, it was considered that house would bee as fitt for ourselves, and soe purchased the lease remaining from Evans with our money, and placed men players, which were Hemings, Condall, Shakspere, &c."

It seems likely that the Blackfriars was opened by the sons of James Burbage about 1598-1600, that also being the period of their removal from the Theatre to the Globe. It further appears from the foregoing that the house was soon leased for the performances of the boys of the Chapel; and this may explain why the Blackfriars is not mentioned among the regular playhouses in 1604. It also seems clear that these boys were the "aiery of children" glanced at in *Hamlet* as the chief favourites of the hour. This tragedy was first printed in 1603 and 1604.

We now turn to the special points of interest which at present concern us in connection with these early playhouses.

Nearly every scene in Shakespeare begins "Enter," and ends "Exit" or "Exeunt." Even *The Tempest* has for its first scene, "on a ship at sea, *enter*" the characters. Now we bear in mind that Shakespeare had little or nothing to do with the publication of his plays; and that the division into scenes was probably the work of other, and later,

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hands. Thus, there is no absolute authority for these divisions of the text; but they probably show us how the plays were acted, and fairly represent the author's intentions.

On the modern stage much effect and variety are given by characters being discovered when the curtain opens, and by the curtain closing on certain characters, who then form a more *or less* natural group, which is meant to strike the imagination, or depict the action in dumb show: a tawdry device often enough. So far, indeed, has the significance of the curtain impressed itself upon dramatists and actors that the word is transferred to the incident or picture upon which the curtain falls; and a telling conclusion to an act or play, becomes, in professional language, "a good curtain." Now, with an amazingly few exceptions, Shakespeare ends every scene, act and play with a bare stage. The probable reason, as I have already surmised, is that in his day the front curtain was not found in public theatres, and that the group ending was, practically, not invented.

But there are many instances in Shakespeare and other poets which do not at first sight square with this theory; and these exceptions to the prevailing practice must be explained.

Although characters are very rarely left upon the stage by Shakespeare, they are discovered not unfrequently. Thus in *Hamlet* we discover Francisco on sentry duty; in *Romeo and Juliet* we find "musicians waiting." A scene in *Timon of Athens* begins "Flaminius waiting, enter a servant to him." Another scene begins "the Senate sitting." In *Antony and Cleopatra* we discover "sentinels on their post." In *Richard II.* an act opens with "Gaunt on a couch"; another discovers the Lords and Commons about the throne in Westminster Hall. In *Measure for Measure*, Mariana is discovered sitting, with a boy singing to her. At the opening of Act V., Mariana and two others are certainly on before additional persons enter and begin the dialogue. In *Richard III.*, we have the Lords of the Council seated in consultation; and a later scene discloses Richard throned. In *The Taming of the Shrew* we have "a banquet set out." In *Julius Cæsar*, Act IV., we find "Antony, Octavius and Lepidus seated at a table." Once we discover Lear sleeping on a bed. In *Pericles* we find a banquet; in a later scene, Pericles on a couch in a curtained pavilion. Another scene in the same play opens with a regular tableau. In *Cymbeline* Imogen is discovered reading in bed. Juliet is also discovered on her bed, after taking the potion. In *A Midsummer Night's Dream* we find Titania asleep. In *Othello* we come upon the Duke and Senators in Council; and in the last act discover Desdemona asleep. In *A Winter's Tale* a court of justice is disclosed. In *Henry VI.*, Part II., the King and others enter to Cardinal Beaufort, who is in bed. In the third part of this play King Henry is discovered reading in prison; and in the next scene King Edward is discovered throned. In *Henry VIII.* we find Queen Katherine working with her women.

As regards characters left upon the stage, we find that Juliet, at the

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end of the potion scene, "throws herself upon the bed." In *King Lear* Kent goes to sleep in the stocks when a scene ends. In *Cymbeline* Iachimo gets into a trunk at the end of a scene. At the close of *Othello* no direction shows what was done with the bodies of the Moor, Desdemona, and Emilia; nor of the lovers in *Romeo and Juliet*, whereas a solemn bearing off is usually accorded to dead persons.

These lists are the outcome of a scrutiny of all Shakespeare's plays, and they are a small harvest out of thirty-seven five-act dramas.

To follow this line of enquiry with other writers of the period, let us take Marlowe's works. Three scenes in *Tamburlaine*, Parts I. and II., open simply with the names of certain characters, without the word "enter"; but nothing points to the characters being discovered. In a later scene we discover a banquet. No exit is prescribed at the end of Part I. The opening directions of two scenes in Part II. call for special notice. One runs—"Callapine with Almeda, his keeper, *discovered*"; the other says —"Zenocrate *is discovered* in her bed of state." Ten persons are about her; she dies, and, after a lament from Tamburlaine, we read, "*the scene closes.*" These words are very explicit, and full weight must be allowed for their exceptional nature. Another scene is headed thus—"Olympia *discovered* alone." The play ends with the death of Tamburlaine, but no removal of his body, nor general *exeunt.* is recorded.

The Tragical History of Dr. Faustus shews at the openings of the first and second acts Faustus in his study; no doubt a discovery. In *The Massacre at Paris* Admiral Coligni is discovered wounded in bed. We may notice, in passing, that this tragedy ends in true Elizabethan style, with the death of the King of France, and preparations for the funeral. "They march out with the body of the King lying on four men's shoulders, with a dead march, drawing weapons on the ground." This is very like the final directions in *Hamlet*, *Lear* and *Coriolanus*.

Dido, Queen of Carthage, opens thus—"Here the curtains draw—there is discovered Jupiter," &c.; and a later scene discovers a character asleep.

To take Massinger. In *The Virgin Martyr* a scene discovers Antoninus asleep on a couch with others about him. In Act V. we read, "Theophilus discovered in his study, books about him." *The Unnatural Combat* discovers "a banquet;" and *The Bondsman* "a table set out with wine," &c. In *The Fatal Dowry* Rochfort "draws a curtain and discovers a table with money and jewels upon it." The same scene ends with a curious stage direction. "Here a passage over the stage, while the act is playing for the marriage of" two of the characters. This episode is not referred to in the dialogue; it was probably a procession in dumb show. Act IV. opens with a dandy before a looking glass, attended by his barber, perfumer, tailor and others. In *The Guardian* "Iolante is heard speaking behind a curtain;" afterwards we read—"Enter Severino before the curtain," and he "draws the curtain and discovers Iolante seated, with a rich banquet and papers set forth."

To take Ben Jonson. A scene in *Every Man in his Humour*, opens with

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"Bobadill discovered lying on a couch; and this particular scene ends without an exit. In *The Poetaster* we read, "Scene draws and discovers Ovid in his study." In *The Fox* we have—"The scene closes upon Volpone." Another scene of this play also "closes"; but the special reason is not obvious. A third scene discloses "Volpone on his couch, Mosca sitting by him." In *Catiline* we read during the first speech—"The curtain draws, and Catiline is discovered in his study." Afterwards "Catiline rises and comes forward." In *The Case is Altered* Juniper is twice discovered sitting at work in his shop.

How, it will be asked, can these discoveries and concealments have been managed without a front curtain to enclose the stage? To explain this, we must ascertain what the form of the Elizabethan stage really was.

The only known contemporary drawing of the interior of an Elizabethan playhouse is a rude sketch contained in some descriptive notes in Latin, written by John de Witt, a Dutchman, who visited the Swan on Bankside in 1596. This has come to light quite recently, and it is a most valuable find. The sketch shows the stage as a raised platform, open beneath, built out into a circular area surrounded by covered galleries. At the back of the stage is an enclosed space, labelled "mimorum ædes," the private domain of the actors; perhaps the "tiring house" of the old writers. Above this is a covered balcony in which the artist places spectators. No vestige of drapery is shown on or about the stage, and no persons are upon it, except the actors engaged with the scene in progress.

Mr. Halliwell-Phillipps thus describes the stage of the first Globe Theatre: "Intersecting the stage were two curtains of arras, one running along near the back, and the other about the centre, either being drawn as occasion required. Upon these tapestries, which are sometimes mentioned as having been in a decayed condition, were generally portrayed human figures, or representations of subjects that included them. These designs had of course no reference to the performance, and there was no moveable or other kind of scenery." In his "Memoranda on the Tragedy of Hamlet," Mr. Halliwell-Phillipps speaks of the necessity of clearing the stage in a natural manner "before the use of drop or other curtains between the acts." As regards the use of a front curtain, he wrote to me in March, 1888: "The subject is one that I have not time to study for myself just now, but there was a curtain at all events in front of the stage previously to the commencement of the play." Mr. Howard Staunton, in his preface to Shakespeare's works, describes the balcony at the back of the stage, the arras hangings and the traverses to be noticed later on; and he distinctly says: "I am of opinion that during Shakespeare's time there was no curtain across the proscenium."

The most practical suggestion that I know as to the form of the old stage is contained in a letter from Mr. William Archer, written in March, 1888, in reply to my enquiries and after he had read my last

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Paper: "For my part," he says, "I do not believe there was any curtain at all to the Elizabethan stage, which was really a platform right out among the audience. * * * It is quite certain that the space under the raised back stage could be curtained off. * * * I daresay there may have been (*i.e.*, for this purpose) two or three traverses one behind the other, but I do not believe the front stage, where the real action took place, could be curtained off at all."

Here, I think, lies the truth of the matter and the solution of most of our apparent difficulties.

A raised balcony is generally recognized as part of the old stage by writers on the Elizabethan drama; but belief in its existence depends chiefly upon the internal evidence of contemporary plays. I therefore give a list of instances from Shakespeare and other writers where the necessity for such a raised place is evident.

In the balcony sat Juliet, while Romeo wooed below. Prospero was there, when made to enter "above invisible," to watch his enemies. When a monument is intended we read, "Enter above Cleopatra" and others. In *King John* we are "before the castle" at Northampton. Arthur comes "on the walls," leaps down, and dies. The stormy histories of *Henry V.* and *Henry VI.* give abundant use for the balcony. We are before the gates of Harfleur; "the Governor and some citizens on the walls, the English forces below." The balcony stands for the walls of Orleans, Rouen, Bourdeaux, Angiers, of York, Coventry, of the Tower of London, and for a raised terrace at Kenilworth Castle. In *Richard III.* we have an episode of grim comedy in which we read, "Enter Gloster, in a gallery, between two bishops." In Marlowe's *Tamburlaine* persons appear on the walls of Balsora and of Babylon. In his *Jew of Malta* Barabas, intent upon a diabolical device, enters "with a hammer above, very busy." In Massinger's *Virgin Martyr* characters enter above, and converse unseen by others on the stage; they depart, and re-enter below. In his *Unnatural Combat* soldiers enter on the walls of a fort. In the *Duke of Milan* a lady "appears at a window above." In the *Renegado* characters enter above to listen, then re-enter below and join the general action. The use of the balcony is traceable in Jonson and Chapman, and it clearly was a most valuable addition to the resources of the stage, and a simple means of obtaining important effects. The play scene in *Hamlet* may have been enacted either in the balcony or in the recess beneath it. Mr. Staunton quotes Malone, who thought that the court who formed the audience sat in the balcony, and, a traverse being drawn across the stage, that the interlude was played *to the balcony* and back to the real audience. This seems a very improbable suggestion.

Pyramus and Thisbe might be enacted on the open stage. The scenic illusion is a joke; and the interlude is followed by a dance of clowns, which would need space.

The existence of a recess beneath the balcony, so far as I know, has been until lately entirely overlooked; yet such a feature seems to result

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structurally from the balcony itself. And this recess, or alcove, must have been as important a part of the stage as the balcony above it. Another list of cases will show how I believe that the recess was used.

May not Juliet's bed-chamber and the monument of the Capulets have been this recess which could be enclosed at the back of the stage? When Hamlet hears the hidden Polonius, he "makes a pass through the arras," and the old courtier dies behind. At the Boar's Head, Falstaff is found "fast asleep behind the arras." In *A Winter's Tale* Paulina undraws a curtain, and discovers the supposed statue of Hermione—no doubt in the alcove. The vision of kings in *Macbeth* may have been presented either in the alcove below, or the balcony over it; and this recess might stand for Mad Tom's hovel, in *King Lear*, Prospero's cell, the cave of Timon, and that of Belarius, in *Cymbeline*, all of which are specified in the stage directions.

The discoveries on the stage, already quoted, are frequently in situations best represented in a confined space, as in beds, or on couches, as with Desdemona, Cardinal Beaufort, Titania, John of Gaunt, Lear, Pericles and Imogen. In *King Henry VI*,. Part II., "the folding doors of an inner chamber are thrown open, and Gloster is discovered dead in his bed." Or we discover persons in studies, as those of Faustus, of Theophilus, and of Ovid; or in a workshop, as in Jonson's *The Case is Altered;* or in a shop in a bazaar at Tunis, as in Massinger's *Renegado*. Where "the scene closes" (to quote the precise stage direction) upon the death-bed of Zenocrate, in *Tamburlaine*, I fancy the action took place in the recess, and that it was the curtains of the recess that closed. When Henry VI. is discovered reading in the Tower, and is murdered by Gloster, I believe the deed was represented in this curtained recess. And this for two reasons: firstly, because we have a discovery to account for, which the recess would make a simple matter; and secondly, because there is no direction as to the King's body. Now, if the murder was done in the recess, the body could be concealed by Gloster afterwards closing the curtains of the recess, as part of the business of the scene. The tomb in Romeo and Juliet which, as foreshadowed in my last paper, I take to have been represented by the recess under the balcony, may have been shut off by closing the curtains before the end of the tragedy; and this would explain the absence of directions as to the bodies of the lovers which I have previously mentioned. In the same way, if Desdemona died on her bed in the recess, Othello's business would naturally bring him there also, to "die upon a kiss," after his self-inflicted wound. The curtains would then close and conceal them, while the survivors would finish the play in front, and go off in the usual way. I grant that the body of Emilia is not thus accounted for. These examples are given to show how much could be done in the way of discoveries and concealments without proscenium curtains, and to show that the words "curtain" and "arras," so frequent in the plays, mean something quite different. Hangings formed the boundary of the stage, and curtains, or "traverses,"

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were carried across the stage, concealing and revealing the back portion, as the incidents enacted required. Drapery came before scenery, and was the background of the Elizabethan stage. Cunnington, in his edition of Jonson, quotes a passage from the *Careless Shepherdess*, by Golfe, in which an ardent playgoer, who loved a good clown, exclaims:—

> "I never saw Reade peeping through the curtain,
> But ravishing joy entered into my heart."

While holding that discoveries and concealments took place in the recess, I admit that there remain a few scenes for which I cannot see how the stage could be set. Among these is a scene already cited, in which the Lords and Commons are disclosed in Westminster Hall: not an easy matter under a balcony.

It is not possible to leave the question of curtain or no curtain in front of the Elizabethan stage without considering the masques presented at Court and elsewhere among the great on festive occasions. Ben Jonson's masques are most valuable evidence as to usages at the time, because, as published, they contain elaborate records of the mode of presentation, presumably from the poet's hand. These show how very much was then imagined and actually done in stage decoration. Here we find not only scenery but transformation scenes. Inigo Jones, the famous architect, was on many occasions Jonson's fellow-worker in these gorgeous devices. In their mounting these masques seem more akin to the religious plays of the Middle Ages than to the public performances of the playhouses of their own period.

In the *Masque of Blackness*, presented at Whitehall on Twelfth-night, 1605-6, we read—

"First, for the scene, was drawn a landscape consisting of small woods, and here and there a void place filled with huntings; which falling, an artificial sea was seen to shoot forth, as if it flowed to the land, raised with waves which seemed to move, and in some places the billows to break."

The Vision of Delight, at Court, 1617, has—"Scene: a street in perspective of fair building discovered."

Neptune's Triumph for the Return of Albion gives this: "His Majesty being set and the loud music ceasing, all that is discovered of a scene are two arched pillars dedicated to Neptune." The poet enters, presumably in front of these pillars "to disperse the argument." Some comic dialogue and a dance follow, after which the poet says: "Well, now expect the scene itself—it opens." Then the Island of Delos is discovered, with masquers ranged upon it, and the island moves forward and then goes back. Then was shown "the first prospective of a maritime palace"; then "the second prospect of the sea is shown"; then "the fleet is discovered."

An Entertainment at Theobalds, 1607. "When the Court entered the gallery after dinner there was nothing seen but a traverse of white across the room, which suddenly withdrawn, was discovered a gloomy place."

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Chloridia: Rites to Chloris and her Nymphs, personated in a Masque at Court by the Queen's Majesty and her ladies, at Shrove-Tide, 1630. The Inventors, Ben Jonson, Inigo Jones.

"The ornament which went about the scene was composed of foliage or leaves, heightened with gold, and interwoven with all sorts of flowers, and naked children playing and climbing among the branches, and in the midst a great garland of flowers, in which was written CHLORIDIA.

"The curtain being drawn up, the scene is discovered, consisting of pleasant hills planted with young trees, and all the lower banks adorned with flowers. And from some hollow parts of these hills fountains came gliding down, which in the far-off landscape seemed to be converted to a river. Over all a serene sky with transparent clouds, giving a great lustre to the whole work, which did intimate the pleasant spring.

"When the spectators had enough fed their eyes with the delight of the scene, in a part of the air a bright cloud begins to break forth, and in it sitting a plump boy in a changeable garment richly adorned, representing the mild Zephyrus. On the other side of the scene, in a purplish cloud, appeareth the Spring, a beautiful maid, her upper garment green, under it a white robe wrought with flowers, a garland on her head."

Later on we read:—"The farther prospect of the scene changeth into air, with a low landscape, in part covered with clouds; and in that instant, the heaven opening, Juno and Iris are seen; and above them many airy spirits sitting in the clouds." In another place:—"Here, out of the earth, ariseth a hill, and on the top of it a globe, on which Fame is seen standing with the trumpet in her hand; and on the hill are seated four persons, Poesy, History, Architecture and Sculpture, who, together with the Nymphs, Floods and Fountains, make a full quire, at which Fame begins to mount, and moving her wings, flieth surging up to heaven."

Then, at the close:—"Fame being hidden in the clouds, the hill sinks, and the heaven closeth. The masquers dance with the Lords,

And thus it ended."

Some masques seemed to have been presented without any stage, consisting simply of speeches, songs and dances, given in the open hall. Chloridia, the last quoted, is exceptional in having no speeches nor action previous to the unfolding of the spectacle. Usually much was spoken by persons who entered the open hall in front of the stage erection, which had its specially designed frontispiece and in which the masque proper was set. Although these costly entertainments at Court are a great contrast to the simple shows of the public theatres, we can trace an important resemblance between the two. In both action was carried on in the open, while special incidents or effects were presented in an enclosed space in the rear

The modern structure for the Passion Play at Ober Ammergau reproduces the same scheme on a greatly increased scale.

In leaving the subject of masques and their mode of presentation,

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we must remember that Shakespeare shows us masques and visions. In *Cymbeline* a dream is presented, with Jupiter in his might. *The Tempest* has a complete masque, with goddesses, dances, and strange noises. The same play has "a quaint device," in which a banquet vanishes. In *King Henry VIII.* the dying queen sees a vision which offers no special difficulties, except the vital one of making it either convincing or beautiful. No doubt the balcony and recess were used for these incidents.

In leaving, too, the subject of scenery, we note in Jonson's stage plays a few indications of the use of scenes in the playhouses. In *Cynthia's Revels*, first played in 1600, and "frequently acted at the Blackfriars by the Children of Queen Elizabeth's Chapel," a character says, "The boy takes me for a piece of perspective, I hold my life, or some silk curtain, come to hang the stage here. Sir Crack, I am none of your fresh pictures that use to beautify the decayed dead arras in a public theatre."

A few words must be said as to the presence of spectators on the stage, that continually recurring grievance of actors even so lately as the middle of the last century.

I think no word from Shakespeare throws light on this point; but from Jonson we learn much. *Cynthia's Revels*, the piece just quoted as played by the Children of the Chapel, begins with an Induction, in which some of the boys talk in their own characters, and quarrel as to who shall speak the prologue. One little fellow gives an imitation.

"Now, Sir, suppose I am one of your genteel auditors, that come in, having paid my money at the door, with much ado, and here I take my place and sit down. [*i.e.* on the stage.] I have three sorts of tobacco in my pocket, my light by me, and thus I begin. [Begins to smoke.] By this light, I wonder that any man is so mad, to come to see these rascally tits play here. They do act like so many wrens, or pismires—not the fifth part of a good face amongst them all. * * * How is't? Well?"

Another boy: "Excellent."

First boy: "Stay; you shall see me do another now; * * * and here I enter."

Second boy: "What, upon the stage, too?"

A third boy: "Yes; and I step forth like one of the children, and ask you—Would you have a stool, sir?"

First boy: "A stool, boy!"

Third boy: "Ay, sir, if you'll give me sixpence, I'll fetch you one."

First boy: "For what, I pray thee? what shall I do with it?"

Third boy: O Lord, sir, will you betray your ignorance so much? Why, throne yourself in state on the stage, as the other gentlemen use, sir. * * * But I pray you, sir, let me be a suitor to you that you will quit our stage then, and take a place, the play is instantly to begin."

I do not yet know the reason for these last words.

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In Jonson's *Bartholomew Fair* a visitor asks at a puppet show, "Have you none of your pretty impudent boys now to bring stools, fill tobacco, fetch ale, and beg money, as they have at other houses?"

The Prologue to Jonson's *The Devil is an Ass* begs the grandees not to crowd the actors on the stage, but give them room to play.

As the actors had to make the best of the inconvenience and artistic impropriety of spectators on the stage, they may have had to do the same in the balcony. Thus, there is no necessary inconsistency in the use of the balcony both for the purposes of the play and also for spectators, as shown by de Witt's sketch of the stage of the Rose theatre, and also in one or two other woodcuts of seventeenth century stages. A strong management may have kept the balcony private on those days when it was needed for the piece to be then played. So also the recess beneath may have been "mimorum ædes" in a general way, but one the actors had to surrender when the exigencies of certain plays required it.

How came the balcony and recess to be constituent parts of the Elizabethan stage—were they reached by a gradual process of evolution? We have seen that plays were habitually acted in inn yards. A few years ago several inns remained in London, both in the City and the Borough, but little changed in essentials since the seventeenth century. A gateway passing under the buildings fronting the street led into a yard with one or more tiers of wooden galleries which, in complete examples, were carried along the four sides, and which gave access to the upper rooms. In such a place the players would set up a platform at the top end of the yard, raising it a few feet above the ground and carrying it back under the end gallery to the wall of the rooms beyond. This made a capital theatre; and not only were the Elizabethan playhouses based on this model, but in them the familiar tavern terms were themselves retained. The commonalty stood in the inn yard, crowding up to the stage. The playhouse pit was often called the "yard," and was open to the sky, like its prototype. The better sort sat in the inn galleries, or watched the play from the adjoining rooms behind. Regular theatres had their "rooms" or private boxes. One side of the inn gallery passed behind and above the platform, and on the platform level a low space was left under that gallery. And thus the balcony and recess of the Elizabethan playhouses were not invented, but discovered ready made. Poets and managers here found an excellent apparatus ready to hand; and I have shown how much the practical working out of the drama followed from these structural facts.

Were the Elizabethan writers, and "the judicious" among their audiences, really satisfied with the imperfect realization of the scenes and incidents of the plays that their simple stage afforded? Probably not. Consider the shows that sound so gorgeous in the records of Jonson's masques, with their fairy pageantry which was so poetical, at least in intention; and can we for a moment doubt that the poets dreamed of the combination of bravery for the eye with the true portrayal of human life: for the union of court masque and play-house

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drama? Must not Rare Ben have yearned to see *Every Man in his Humour* and the *Alchymist* played with practicable streets and houses, and varied lighting for day and night, cunningly realistic; and must not the playgoer from the court have longed for the story of *Hamlet*, or *The Tempest* made doubly real by ingenious "perspectives" and lovely groups devised by Inigo Jones?

But the dream was one thing, and the possibility quite another. The housekeepers of the Curtain or the Globe could afford but slender display when they set forth the stirring tale of Agincourt. And so Shakespeare laughs at the idea of attempting realism; and frankly calls upon his audience to picture for themselves "the vasty fields of France" upon a "scaffold" within a "wooden O." The chorus to *King Henry V.* is the glorious wedding of soaring poetry and common sense thrift. The master knew that stage illusion is good or bad, according as it is received. "The best in this kind are but as shadows; and the worse are no worse, if imagination mend them."

I have left untouched many points of interest in connection with the Elizabethan playhouses. We are told that there were "public" houses with open yards, for daylight performances, and "private" houses, wholly enclosed, where plays were acted by artificial light, or which could be darkened, if required, for special stage effects. Nothing has been said of the use of explanatory labels on the stage, nor of the prices of admission to various parts of the house, and evidence as to this may be gleaned from old plays. Was the upper part of the stage furnished in some manner and called "the heavens"? And was it really draped in black for tragedies?

"Hung be the heavens with black, yield day to night!"

My original purpose, then, was to learn whether there was, or was not, a front curtain to the old English stage. While engaged on this enquiry the special construction of the back of the stage (resulting from the form of the old English inn) forced itself upon me, and the two matters clearly became parts of one question. For it was, I believe, the peculiar facilities for stage effects given by the balcony and recess that made possible the discoveries and concealments of the old plays. And it was, I also believe, because there was no front curtain that the characters have to be visibly brought on at the beginning of each play and division of a play; and, at the end of every play and division of a play, that the dialogue leads up to an exit as the almost invariable conclusion.

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A FEW NOTES ON THE KEW HERBARIUM.

By the Rev. T. A. Preston, M.A. (Read before Section "D.")

The Royal Herbarium at Kew was first kept in a building on the right hand side of the entrance to the Royal Gardens, formerly occupied by the King of Hanover. About fifteen years ago the house was considerably enlarged by pulling down a part of the old structure at the back, and building on the site an enormous room or hall, 80 feet long, consisting of a ground floor and two broad galleries, extending all round the hall. These galleries are divided into recesses, in much the same way that libraries are divided, each recess being furnished with a table, chair, and writing implements, whilst the "walls" are composed of the cabinets in which the specimens are stored. These cabinets are 4 feet high, 2 feet broad, and 18 inches deep, and each contains, when full, many hundreds of specimens. About twenty of these cabinets are added yearly, and yet, enormous as the collection is, it is possibly not the largest Herbarium in existence, though, as the Continental Herbaria are arranged on a different plan, it is impossible to tell. But at any rate, the admirable manner in which the specimens are kept at Kew is such, that it places the Kew Herbarium a long way ahead of all other similar institutions.

The most important part of the Collection is the set of Indian and Colonial plants. Here are deposited the types from which the descriptions in the Indian and Colonial Floras were made, and the whole collection is so arranged that, of almost any of the 46,000 plants that grow on British soil, a specimen, duly named and authenticated, can be referred to in a few minutes. Besides these, the Herbarium contains a large collection of plants from other parts of the world.

"At the death of Sir William Hooker (in 1866) it was estimated to contain one million specimens, counting as one all individuals of the same plant from the same locality. At present about twenty thousand specimens are added every year. This would make the number of specimens in the Herbarium one and a half million. When dried collections are examined, the rule is, that in recompense for the trouble of naming them, the Herbarium is allowed to keep whatever is required, and it is to a large extent in this way that its growth goes on. At present (in 1886), for instance, Dr. Aitchison, the naturalist attached to the Afghan Boundary Commission, is engaged in working out the identification of the 800 species he has collected. During the last ten years the missionaries in Madagascar have sent home 5,000 numbered specimens, and of these the determinations have been sent out to them,

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and the new species, of which there was enough material, 700 or 800 in number, have been described and named.

"The foundation of the Kew Herbarium was the private collection, which Sir William Hooker brought with him from Glasgow, in 1840, and to this was added the herbarium of Mr. Bentham, and a set of the specimens collected in the Antarctic and Indian travels of Sir J. D. Hooker. Of late years the principal additions have been the European herbaria of Gay and John Stuart Mill, the Orchids of Lindley, the British Herbaria of Watson and Borrer, the Mosses of Bruch, Schimper, and Hunt, the Lichens of Leighton, the Algae of Mrs. Griffiths, and the Fungi of Berkeley and Cooke. Besides the Indian and Colonial Floras, Mr. Bentham and Sir J. D. Hooker have elaborated a "Genera Plantarum," in which the ten thousand genera of flowering plants are fully described and classified under their natural orders. This was the work of twenty years, and it is used in the garden, herbarium, and museums as the standard of nomenclature and classification." *

The house in which the Herbarium was originally kept is now fully occupied with the Library, the collections of Cryptogams, as well as other collections to be alluded to later on.

We will first trace the "fate" of a collection of plants just received; for sometimes a collection of many thousand specimens makes its appearance. If the collection comes from some country not well known, and novelties may be expected, the first thing is to label every specimen with locality and other information supplied with the collection. It is then handed to one of the officials, who selects all the specimens required for the Herbarium, placing the others aside as duplicates. In some special cases the collection passes through several hands, each official selecting the specimens of those orders, to which he has paid particular attention. At length, when all the specimens have been properly allocated, those destined for the Herbarium are placed on proper sheets of paper, carefully labelled, and then put in a cupboard, from which they are taken to be fastened down, after which they are placed in a second cupboard. Periodically the whole force of the establishment is summoned to distribute the specimens, thus prepared, in their proper cabinets. The specific name of each specimen is added, if it can be done readily, otherwise nothing more than the genus is at that time decided, the detailed work of finally naming the specimens being reserved for a future opportunity. When the collection has thus been properly distributed the duplicates are at once divided amongst the various public institutions, whose claims may be considered sufficient to entitle them to a share of the "spoils."

Supposing the collection just arrived to be a collection of (say) European plants, or that of some author, the same care is taken in selecting what is required, only it must be noted that specimens from which published descriptions have been written, called "type specimens," are considered of far more importance than merely good specimens; if a

* Extract from a lecture on Kew Gardens, delivered by Mr. Baker, Jan. 26, 1886.

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thoroughly representative specimen exists in the Herbarium, no further specimens of that species are added, unless there is something about them of special importance; thus the Harbarium is kept as much as possible within bounds. The same process of "distribution and disposal of duplicates" is observed, and these latter are parted with as soon as possible; no needless accumulation of useless specimens is allowed to exist.

I should say that the specimens selected for the Herbarium, even if they have been previously poisoned, go through that process before being fastened down. This process may be called a "necessary evil," for its necessity is evident, but it takes all the colour out of the specimens, and is thus at the same time a very great evil.

The fastening down of the specimens is most admirable. The gum used is a mixture of gum arabic and gum tragacanth. The same quantity of each must be taken, the latter being in powder, and care must be taken that it is unadulterated. The gum arabic must be first dissolved, and when quite melted, the tragacanth stirred in, and the whole left for some hours. By that time the gum tragacanth will have dissolved and swollen up enormously; the mixture may then be bottled till required for use. When the specimens are ready for fastening down take a sufficient quantity of the gum and mix it with water till it runs freely from the brush. Then place the specimen on a piece of waste paper or glass, and gum the whole surface; transfer the specimen to its proper place on its sheet of paper, and remove any superfluous gum with absorbing paper; then fasten down all thick stems with braces, made of the same kind of paper or not, according to fancy, and cover with several sheets of drying paper. On this place another sheet with its specimen, and so on, and finally let the whole be subjected to pressure till quite dry. Plants thus fastened down are safe, and with the great handling that some of them get, such fastening is absolutely necessary. Dissections or pieces necessary for holding up to the light are kept in little pockets attached to the sheet on which the rest of the specimen is fastened.

The wonderful manner in which the whole Herbarium is thus kept in order can only be judged by experiment. I myself took a specimen to be named. Mr. Baker had forgotten the specific name, and yet, though we had to ascend two flights of stairs, the proper specimens were selected within three minutes from the time of starting.

When a person wants to study any plants, he has, of course, to get the proper order, and as soon as he states what he wants to study, he is at once conducted to the proper recess, the cabinets containing the specimens are pointed out, and he is left to his devices; in fact, on entering, nothing seems to be going on, but a stay of half a day in the building will convince anyone that it is certainly not the least busy, I might almost say the *most* busy, of any public or private institution. No time is lost; you state your business, enter your name in the Visitors' Book, go to your place, and there you are.

When the Royal Commission was making enquiries about the pro-

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posed museums at South Kensington, and how to make them most useful, the late director, Sir J. W. D. Hooker, was asked whether there was any need for two identical collections, one at Kew and the other at Kensington. Sir J. Hooker suggested that the general collection of plants from the whole world should be kept at Kew, and all new plants should, in the first instance, go there, so as to keep it as complete as possible. A second collection of this sort was unnecessary, consequently the plants at South Kensington should be arranged according to countries, so that if a person were going to any particular country, he might see at once what plants he would be likely to meet with. It should be the aim of the Kew authorities to make these local collections as perfect as possible, so that the two establishments should work together and no rivalry should exist between them.

This advice, I am sorry to say, was not acted upon, as the Kensington authorities did not want to "play second fiddle." It is a great mistake, but I am inclined to fancy that Sir Joseph Hooker's advice is now being acted upon. Besides these local collections, they have also at Kensington all the "Historical Collections," and any others which have come into possession of the nation, and which it is deemed advisable to keep intact.

Another Department of the Kew Herbarium is that, where figures of all plants, as far as possible, are collected. If the figure has been published, a copy is procured; but, in addition, many others are drawn specially for the Herbarium, and all are kept duly arranged in volumes.

Another department must be noticed, as it is of very great importance. As far as possible every botanical work, professing to give descriptions of new species, is examined by the authorities, who take care that all such plants are really new, and if such is not the case, the fact is at once notified and corrected. I called on Mr. Baker one day when he was examining a new work on the ferns of Brazil, in which the author professed to describe some hundreds of new species. On my asking whether he was always correct, Mr. Baker informed that only about twenty were new! Such a work as this is most valuable, especially as some people try to make out new species without sufficient information on the subject.

Perhaps I may mention another duty which falls to the Herbarium. The gardens, with the living plants, are managed by a set of authorities distinct from those of the Herbarium, except the director. The soil, in which plants arrive from foreign countries, is carefully kept, in case anything new turns up, which is not uncommonly the case. All these, as well as the plants in the gardens, have to be named by the Herbarium authorities. Every plant, then, which requires a name, is sent there; plants also from nurserymen and others are also named; the "fee" for doing this being a specimen of the plant so named. As there are about 10,000 species in the gardens, and 46,000 species in the British possessions, and as it often takes an hour to work out the name of a single specimen, such a work, though not "showy," is at the same time by no means an insignificant one.

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Another work, that of recording the notice of every plant as it appears in print, was undertaken some years ago at Kew; but it naturally could only be carried on to a very limited extent. Some few years ago this was more developed by Mr. Jackson, when the magnitude of the work began to assume enormous proportions; for it was then determined to commence at the very beginning of descriptive botany and trace out each species and its name so as to arrive at the "first name" of each plant. "Somewhere about 1990" was vaguely fixed for its completion; but this work has now been put on a different footing, in consequence of funds being bequeathed by Mr. Darwin for the purpose. A special "Nomenclator of Plants" is, or shortly will be, appointed, and thus the work will probably be finished ere the present generation has passed away. Its magnitude will be such that Parliament will be asked to supply funds for its publication.

"Two periodicals are published in connection with Kew, the 'Botanical Magazine,' in which six new or interesting plants, fit for cultivation, are figured every month. This is now (in 1886) in its 112th volume, and contains nearly 7,000 coloured figures, all drawn from living plants. In the 'Icones Plantarum,' of which the seventeenth century is now in progress, the more interesting new plants that come to Kew in the form of dried specimens are figured and described. In the same buildings as the dried plants there is as full a collection of all the books and pamphlets on botany as the authorities have been able to get together. The number of these volumes is about 10,000. This occupies four rooms of the old palace. There is also a large collection of drawings arranged in portfolios in systematic order. For naming living plants from the garden these drawings are very much used, for of course they show the colouring of flowers far better than the dried specimens possibly can." †

It will thus be seen that work at the Royal Herbarium at Kew is no child's play, and moreover requires constant study to keep pace with modern discovery. But there is no show, all is done in the quietest and and most unostentatious manner possible; and when it is remembered that time is limited, we can understand Mr. Baker's remark, that "many things" (which I have mentioned) "are what we attempt to do so far as time will allow rather than what we actually get done." There is plenty of opportunity for hard work, and it is not lost sight of.

† Extract from a lecture on Kew Gardens, delivered by Mr. Baker, Jan. 26, 1886.

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MICRO-ORGANISMS IN THEIR RELATIONS TO THE HIGHER ANIMALS.

By Frank M. Pope, M.B. (Read before Section "E.")

The small bodies of various nature to which in their aggregate is applied the name of micro-organisms, belong for the most part to the lowest orders of the vegetable, and not the animal kingdom. The process of investigating their life history, however, demands such entirely different methods from those used in the study of botany that "Bacteriology" has taken the position of an almost independent science, and a man may be considered a good botanist who knows a little of this newest of the sciences. This being the case, I thought it would not be trespassing too much on the domain of our sister section if I submitted to you a few considerations on these small organisms, and I had the less doubt on the subject, as I wish to regard them for the purpose of this paper rather in their relation to the higher animals and man, than from the point of view of their morphology, though I think it as well to glance for a few minutes at the state of our knowledge with regard to this latter subject before proceeding to the main portion of my paper.

The first undoubted observation as to the existence of small microscopical living beings in our surroundings was made by Ehrenberg, who found numerous organisms in water and dust, and named them "Infusionstierchen"—Infusion animals. Eight years afterwards the vegetable nature of yeast was discovered by Cargnard-Latour and Schwann, although the cell form had been seen much earlier—(first by Leuwenhoek, 1680)—and their organised and vegetable character had been suspected by several investigators. Schwann also, in the year 1837, asserted, as the result of experiments, that the atmospheric air was constantly laden with fermentative and putrefactive germs, and also that certain fermentative processes were dependent on the access of living organisms.

From that time dates the lasting and active interest in micro-organisms, and the development of the subject has chiefly taken two different directions. On the one hand, the problem investigated was the relation between the fermentative germs and the processes of fermentation and putrefaction. On the other hand, the attempt was made to demonstrate a casual connection between similar minute living bodies and infective diseases in man and animals, a connection which various hypotheses and analogies rendered probable. It would detain us too long to consider every step that has been successively taken in these two directions. It is sufficient to notice that a large band of observers, among the most famous of whom are Cohn, Pasteur, Lister, and Koch, have at length succeeded in demonstrating, beyond the possibility of

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cavil, that living cells or minute organisms, similar to yeast, are the only cause of every fermentation, while with regard to the infective diseases a special micro-organism has been detected as invariably present in many of them, and the causal connection of each with its special disease has been established in some cases, and it seems likely that it will eventually be so in all.

The earliest positive demonstration of the connection of a fungus with disease was made in 1835, by Bassi, who showed that an organism of this nature was the cause of muscardine, a fatal disease of silkworms, and the first infective disease of man shows to be due to a rod-shaped organism in the blood was anthrax.

The fungi (mycetes) belong to the cryptogams, that great division of the vegetable kingdom which is characterised by propagation by means of spores in contrast to the other great division of the phanerogams. These fungi are divided into—*I. True or Mould Fungi. II.—Mycetozoa. III.—Yeast Fungi* or *blastomycetes*, and *IV.—Fission Fungi*, or *Schizomycetes*. I must assume a general knowledge of, at any rate, the external appearance of representatives of the 1st and 3rd groups, such as mucor, or yeast. The mycetozoa are less known. They appear as slimy bodies, not unlike amœbæ; indeed some amœbæ appear to be one stage in the life history of certain mycetozoa, but they appear always to form spores at some part of their existence. I shall have to refer to these later on, when speaking of the parasitism of some animal micro-organisms. The Schizomycetes, or fission fungi, include the Bacteria and Micrococci, and it is among these that the most numerous instances of parasitism in the higher animals occur. They may be divided into—1, Micrococci; 2, Bacilli; 3, Spirilla; and 4, those with variable vegetative forms.

The Micrococci are spherical or egg-shaped cells, multiplying by fission, and always forming spherical cells after division. They do not show spontaneous movement. Endogenous spore formation does not occur in them; we either observe no spore formation at all (in most cases), or else so called Arthrospores are present, and are distinguished from the other cells by their size and refracting character. In some micrococci the cells are not *isodiametric*, but the one diameter exceeds the other so much that an oval or egg-form results. Further, the spherical form is often not distinctly marked when the act of fission has begun, and while the two cells still adhere to one another and the constriction is incomplete *diplococcus*. If, after division, the cells remain near one another, one gets the various arrangements known as *Staphylo-Coccus, strepto coccus, Sarcina* and *Zoogloea*.

Bacilli:—Rods, in which the longitudinal diameter is 2, 3, or many times in excess of the transverse. The organisms belonging to the class of the Bacilli, for the most part pass through a definite cycle of forms, so that they do not appear exclusively in the vegetative form *Bacillus;* many can form threads, and in these spores. In others there is only well-marked thread formation; others produce spores in the

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middle or at the end; most of them form at times all sorts of involutive forms.

The bacilli occurs either in a quiescent stage, in which case they are often arranged in threads, heaps, or *Zooglœa*, or in a swarming stage. In many forms, however, the latter stage has not yet been observed. Now and then a mistake may be made between a bacillus on one end and a micrococcus.

Spirilla.—The typical forms are spirally-twisted threads, which produce new spirals by fission, and which are often united in swarms. As to the existence of a cycle of forms in the spirilla there is very little known, but they seem to have a special tendency to the formation of involution forms. In the case of some spirilla it can be distinctly seen that the spirals are composed of short curved rods; under certain circumstances these rods form the prominent vegetative form, while under other conditions they become fused together and spiral threads are developed.

The fourth class consists of organisms which pass through stages similar to those of the other classes at different times of their life history.

I must pass rapidly over the means of investigating these lower fungi. It has been found possible to cultivate them with as much accuracy as higher plants if due attention be paid to temperature, soil, &c., and it has been found that bacteria, which resemble one another so closely, that they cannot be distinguished microscopically, can yet be known with accuracy by the manner of their growth. While some fungi prove fatal from mechanical interference with the vital processes of their host; such as anthrax, which blocks the blood vessels, and *Bothrytis*, which invades the whole silkworm larva, others elaborate, as products of their growth, substances which produce the greatest effect on the higher animals. We are familiar with the alcohol produced by the yeast plant, but in investigating putrifying mixtures, the discovery was made that under the influence of bacteria, nitrogenous bases arise, which are in many respects similar to the vegetable alkaloids (*strychnine, morphine, &c.*) Some of these bodies are innocuous to the higher organisms; others, however, like the alkaloids, exert a poisonous action. These poisonous alkaloids were found in great abundance in putrifying dead bodies, and were consequently termed Cadaveric alkaloids or ptomaines. They are very numerous, and much work has been expended in investigating their nature. To give you some idea of what has been done in this side branch of chemistry, I give you a few names. NON-POISONOUS ALKALOIDS—Neuridine—Gadinine—Cadaverine—Atiescine—Saprine—Choline. POISONOUS BASES—Peptotoxine—Neurin—Ethylendiamine—Muscarin.

This branch of the subject is of immense importance as serving to explain how in some cases a local development of bacteria may lead to a general constitutional disease. The local growth being the laboratory, where the poison is manufactured, which is taken up into the blood and circulated all over the body.

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Many fungi are parasitic. It does not of necessity follow that injury to the host is the consequence of such a parasitism; on the contrary, there are certain parasites which can live in an animal for a long time without in any way influencing its normal existence, and indeed in some cases the partnership appears to be mutually beneficial. As a rule, however, the advent of parasites, and more especially of the parasitic fungi, is accompanied by more or less severe injury to the organisms which they attack.

Among the large number of the fungi which are capable of leading a parasitic life we notice, when we study them accurately, differences as regards the mode of the parasitisms which render it easier to understand this peculiar phenomenon. Many of the parasitic fungi are only able to lead this kind of existence, and these can carry on their vital functions either not at all or with the greatest difficulty on dead substrata. Other fungi, on the contrary, also flourish as saprophytes, and their parasitic existence is in fact only a continuation of the wide limits within which they can carry on their life and action. *De Bary* gives the following classification of parasitic fungi:—

1. Obligatory Parasites.—These require a parasitic life in order to attain their full development. They may be divided into two classes—namely *(a) Strictly obligatory parasites* which only occur in nature as parasites and can be cultivated on dead substrata only on artificial conditions. *(b) Facultative saprophytes*, which as a rule are parasitic, but can exist under certain circumstances as saprophytes and can pass through some portion of their developmental cycle as such.

2. Facultative Parasites.—These are species which are usually saprophytes, but which occasionally become parasites. There are also

3. Obligatory Saprophytes, which are never parasitic, but which resemble the parasitic fungi so closely that they must be placed in the same group.

The *mould* fungi are not so commonly found parasitic in animals, but are frequently so in plants. Among animals it is chiefly the invertebrata, and among these the insects which are attacked by moulds. The infection always occurs by the penetration of the mycelial threads into the external uninjured skin. In the case of *Empusa radicans* it has been demonstrated as the result of experiments that infection never occurs from the intestine. In some cases the fungus may enter almost anywhere; for example, *Laboulbenia* can penetrate through the back, head, legs, or wings of flies. In other cases the place of entrance is limited; *Empusa muscæ*, for example, can only enter at the abdomen of a fly, and in the case of the isariæ the infection of the caterpillars occurs through the stigmata of the tracheæ. In some cases the parasitic fungi cause very little inconvenience to their host. Thus *Laboulbenia muscæ may* exert no injurious action, but the insects *usually* die. The mycelium threads, when they have penetrated into the body, grow through the muscle and fatty tissue, and usually give off conidia in the blood which grow to form an extensive mycelium; during

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the process there is an almost entire consumption of the animal attacked. An infection by *Saprolegnia* has been observed in fishes. The fungus occasions in the first place, and very gradually, a disturbance of the functions of the skin and an affection of the gills, and, according to De Bary, the disease developes only in fish which are already ill from other causes. In the case of birds, mould fungi occur with comparative frequency in the respiratory organs. They develope partly in the trachea and in the bronchi, partly also in the tissue of the lungs. They cause severe disturbance of respiration and ultimately lead to the death of the animal. The forms which have been found are species of aspergillus and mucor. In man the mould fungi are chiefly met with on the surface of the skin where they cause such diseases as ringworm, *tinea tonsurans*. If the spores of certain species be injected into a vein, sprouting of spores occurs at numerous points, and if many spores be injected the animal dies. The fact that not many species of mould fungi are found parasitic in the bodies of warm-blooded animals is accounted for by the reason that few have the power of living at the high temperature of these bodies, while they are unable to sporulate unless in contact with free air.

Budding or yeast fungi are seldom or never met with as parasites. *(See Note at end.)*

The *fission fungi* are frequently found as parasites in the bodies of warm-blooded animals, but by no means can all bacteria live in the living animal; and we must here also employ De Bary's classification of obligatory parasites, facultative parasites, and true saprophytes. The species belonging to the group of the saprophytes are more numerous than the others, and these, while living in the body, cause no injury to it. The least amount of parasitic energy is shown by those bacteria which seldom multiply in the interior of the living body, but vegetate only on the surface of the skin, mucous membranes, wounds, the intestines, &c., and cause injury to the body by producing ptomaines which, being soluble, pass into the tissues and act as poisons. Some bacteria have a more marked disease-causing action, in that they produce very poisonous ptomaines to which the bodies of warm-blooded animals have not become gradually adapted. It not uncommonly happens that the body being weakened by the ptomaines, the bacteria are unable to invade the tissues which normally could have resisted them.

A further stage is represented by those bacteria which can from the first invade the interior of the living body and multiply there. These either lead to local disease at the place of entrance, or they spread through the body with the circulation, and grow in the whole of the capillary vascular system. They then cause either a morbid growth of tissue or its necrotic destruction.

A class of bacteria known as anaërobes, owing to the fact that oxygen is injurious to their growth and development, can only find their way into the living body where some local destruction of tissue has taken place, and they then extend into the parts most poorly supplied with

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oxygen, as the subcataneous cellular tissue and serous coverings of organs. Another method is growth in lymph channels—the micrococci of erysipelas show this markedly.

Finally, the most poisonous class are those bacteria which can live in the free blood stream. These multiply very readily and sometimes completely occlude the smaller vessels and invade the blood corpuscules, leading to great tissue change and profound disturbance of all the vital functions.

We see here the picture of an army of micro-organisms ever ready to invade the animal body and weaken or destroy it. It is next necessary to glance at the means of defence which the latter possesses against this invasion.

Metschnikoff showed for some invertebrata and reptilia that bacteria introduced into the body cavity or under the skin were taken up by leucocytes and destroyed or digested in their substances, and he inferred that the same process occurred in warm-blooded animals. It seems more probable, however, that in these latter the destruction of the micro-organisms is effected by the endothelial cells of the small blood vessels and capillaries. If these cells are relatively stronger than the bacteria they devour and destroy them ; if, however, the contrary is the case, the cells themselves succumb, and the bacteria feed on their dead substance and multiply.

By certain processes it is possible to so alter many bacteria that they lose certain of their vital functions, this loss continuing for a long time, even when their cultivation is continued afterwards under normal conditions. The vital phenomena which are lost by the bacteria are chiefly the power of producing disease and fermentation. The most important means we have of producing this so-called attenuation of the virus of the organisms are heat, oxygen, and drying. By cultivating them at a higher temperature than quite meets their mode of life we can, while still allowing them to grow freely, so alter them that while before this attenuation they would have caused the most serious effects if introduced into the animal body, they may be subsequently safely introduced without doing any harm.

Now comes a very remarkable point. If any one species of bacteria has at any time invaded an animal's body and that animal has successfully resisted the invasion and survived the attack, its body is peculiarly resistant to that particular species of micro-organisms for a long time afterwards. This accounts for the resistance of the body to a second attack of some of the ordinary infectious diseases. But it has been also found that if attenuated organisms have been inoculated into an animal it becomes resistant to unattenuated ones of the same species, and this is the basis of so-called preventive inoculation. In some cases the products of the growth of the organism are used for inoculation and not the organism itself. The most familiar example of this is the inoculation for anthrax now frequently practised. The bacteria of anthrax are cultivated at a high temperature, 42°-43°C for some

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days. At the end of that time they are injected beneath the skin of an animal, which is afterwards proof against this virulent disease. Pasteur's treatment of hydrophobia, and presumably Koch's treatment of consumption depend on similar processes, though the methods used for producing attenuation are not the same in each instance. I see no reason why the term micro-organism should be confined to the lowest plants, and so will conclude by drawing your attention to the fact, that lately notice has been taken of the occurrence of certain of the protozoa as parasites, and as possible producers of disease. As is well known, the livers of rabbits frequently contain small sacs which, when in masses, form whitish patches. These have been termed *Coccidium Oviforme*. Bodies similar to these have been discovered in the human body as well as in those of some domestic animals. They consist of oval-shaped capsules. A, early stage. B, later stage. C, Psorospermiæ, or pseudonavicellæ. They belong presumably to the Gregarinidæ, whose mode of reproduction is similar. They appear only to be injurious by mechanical means in the liver. They creep up the bile duct from the intestine, and then invade a large number of cells. Our knowledge with regard to these is at present very meagre. Special interest has been attached to them lately by the fact that in a certain disease of the skin, which is almost invariably followed by cancer, bodies resembling these have been found, and a causal connection has been suspected to exist between the two. Nothing definite, however, has been proved. It must be pointed out that there is great resemblance between some of these bodies and the Myxomycetes, of which I spoke at the beginning. The Monadineæ resemble much these free spores or psorospermiæ, and the nature of any such bodies found is necessarily extremely uncertain unless the entire life history of the organisms can be traced. Mere microscopical examination gives us little or no assistance.

Of such a subject as this only a brief resumé can be given, but if this should serve as an introduction to the subject for any of you, I can assure you that there is an enormous and fruitful field of work for anyone who likes to take it up.

Since the above Paper was written, Dr. Russell has published a most important research on a micro-organism occurring in cancer. By certain staining methods bodies can be seen which have the appearance of Blastomycetic organisms reproducing by budding. It is too early to state anything positively with regard to their nature or their causal connection with the disease, but Dr. Russell's observations seem to modify the opinion that cancer might be due to the parasitism of a psorosperm.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

October 21st, 1890.—Paper by the Chairman of the Section, Mr. WILLIAM SIMPSON, "The Future of Political Economy."

There were eighteen members present, the largest attendance since the formation of the Section.

Mr. S. J. GIMSON's name was added to the list of members.

November 18th.—Paper by Mr. A. H. PAGET: "The Elizabethan Playhouses."

Resolution as follows, moved by Mr. COOPER, seconded by Mr. FRANKLIN, and carried, "That this Section recommends the publication *in extenso* of Mr. A. H. PAGET's Paper in the Transactions." *(Printed at page 237).*

December 16th.—Paper by Mr. R. HARVEY, LL.B., on "George Borrow."

W. SIMPSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

The Meeting usually held in *September* was deferred, in consequence of the room being required for the Meeting of the Midland Union of Natural History Societies.

October 15th.—Mr. E. F. COOPER, F.L.S., reported the finding of *Chlora perfoliata* by Mr. POCHIN, at Redhill, near Humberstone.

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Exhibitions.—Specimens of *Gleditschia* and *Asclepias*, from Switzerland, and of *Colutea arborescens*, from Spinney-hill Park, by Miss HOTTINGER.

Legumes of *Entada scandens*, from the Collection of Mr. NEVINSON, by Mr. MOTT.

Legumes of *Centrolobium robustum*, *Ceratonia siliqua*, *Cæsalpinia coriaria* (Divi-Divi), *Arachis hypogæa* (Ground Nuts), and of various South American plants, sent by the Chairman.

In the absence of the Chairman, Mr. MOTT explained the growth of Ground Nuts, and pointed out that pod-bearing plants are not necessarily Papilionaceous; some belong to *Mimosæ*, some to *Cæsalpineæ*, and some to *Papilionaceæ*, which are the three Sections of the order Leguminosæ. He also said that it was the general opinion that a pod was formed from a leaf, folded over, and with the two edges united, but he was not satisfied with that theory.

Dr. TOMKINS pointed out that the theory probably arose from the fact that some plants (as Cycas) bear seeds along the edge of their leaves.

November 19th.—Mr. MOTT introduced to, and pressed upon, the notice of the Section the claims of the National Home Reading Union, and proposed that a Circle in connection with the Union should be formed, with the present Chairman as leader, to study the Special Course of Organic Science.

After some discussion the motion was carried, and eight members gave in their names as members of the Circle.

Paper.—The CHAIRMAN read a short account of the Kew Herbarium, pointing out the method adopted of dealing with the additions, amounting to about 20,000 annually; and the different departments whereby is kept up as accurate a knowledge as possible of the literature of the science. (Printed at page 251.)

The CHAIRMAN then proposed that the Section should form a Herbarium of Leicestershire plants, as a companion to the Leicestershire Flora, published by the Society. The scheme was approved of, and a sub-committee was appointed to draw up full details and present them to the Section at their next meeting.

Exhibitions.—Specimens of *Euryhia paniculata*, *Solanum Jasminoides*, *Asclepias syriaca*, and other interesting plants, by Miss HOTTINGER.

The Fruit of the Sand-box Tree *(Hura crepitans)* from South America, and specimens of the mounting of the specimens, as adopted at Kew, by the CHAIRMAN.

Specimen of *Rubus laciniata*, by Dr. TOMKINS.

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FIELD DAY EXCURSION.

October 8th.—Fungus Foray to Great Stretton Hall by the kind invitation of CHARLES PACKE, Esq. Eighteen kinds of Fungi were discovered, two of them new to the county—viz., *Agaricus (Volvaria), gleiocephalus*, and *Gomphidius viscidus*. Nine members of the Section took part in the Foray, and were much interested in the fine collection of Conifers and other remarkable plants in the grounds of the Hall. Tea was kindly provided for the party by Mr. and Mrs. PACKE.

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

September 8th.—Mr. W. A. VICE, M.B., took the Chair in the absence of both Dr. POPE and the Vice-Chairman.

A vote of thanks, proposed by Mr. W. P. PYCRAFT and seconded by the Secretary, was unanimously passed to Mr. W. J. WOOLLEY for his kindness in permitting the members to inspect his grounds at Barrow Cliff, on August 9th.

A Paper entitled "South America and its Peoples" was then read by the Rev. A. L. SPARKES, M.A., B.Sc., in which, after adverting to the beauty of the scenery and some of the cities of South America, he gave some valuable information concerning some of the political institutions of the country, and the customs and characters of the inhabitants, which he divided into four great classes—viz., A, the original inhabitants of the country, descendants of those who possessed the country before the time of the Spanish conquest by Pizarro and his generals; B, the descendants of those Spanish conquerers; C, the mixed race resulting from the association of the Spanish conquerers with the original inhabitants; and D, the European element recently introduced by the encouragement of emigration. These classes Mr. SPARKES described in some detail, and, while speaking of the habits of the "Gauchos," gave a most interesting description of their method of handling the "lasso" and "bolas." The scientific principles involved in the use of each were also illustrated in lucid language and by admirable diagrams. The lecturer's personal experiences amongst the Indians of the Andes enabled him to bring many facts of interest concerning these savage and nomadic tribes under the notice of the Section.

At the conclusion of his Paper Mr. SPARKES exhibited a number of interesting objects collected by him during his residence in South

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America, including two small live parrots, a pouch-like bird's nest made of vegetable fibres, a very handsome bed-covering ornamented with feathers, and specimens of native bow and arrows, lasso, and bolas.

A discussion followed, in which many of those present took part, after which a vote of thanks to Mr. SPARKES, proposed by the Chairman, was carried unanimously.

October 13th.—Mr. MONTAGU BROWNE, F.Z.S., F.G.S., Vice-Chairman, in the Chair.

A communication dealing with the Palæontology of the Leicestershire Lias was brought forward by Mr. H. E. QUILTER, who apologised for its incompleteness owing to recent indisposition.

After some general remarks upon the occurrence of the various life zones of the Lias in the county, he proceeded to sketch their palæontological features individually, commencing with the zone of *Psiloceras planorbe* in the Lower Lias, and ending with that of *Stephanoceras commune* in the Upper Lias, noticing at the same time the principal exposures of the various zones in the district. This portion of the Paper was followed by a list of both vertebrate and invertebrate fossils, in which the beds from which the various remains had been obtained were indicated.

At the conclusion of the Paper a short discussion followed.

Mr. BURROWS remarked the absence of all reference by Mr. QUILTER to the occurrence of vegetable remains.

The VICE-CHAIRMAN, in summing up, said he considered that little or no new information had been added to Mr. QUILTER's previous Paper published in the "Geological Magazine" for February, 1886, and he also considered it unfortunate that so much reliance had apparently been placed upon Professor JUDD's former work in certain districts, without reference to recent researches, seeing that it was highly probable that, owing to the work now being carried on by Mr. STRANGWAYS, of H.M. Geological Survey, and also by himself, modifications in certain zones, and great additions to the palæontology of the district, would have to be made.

November 10th—A Paper was read by the CHAIRMAN, entitled "Micro Organisms, and their Relations to the Higher Animals." (Printed at page 256)

Messrs. W. A. VICE, and E. PATTISON, took part in the discussion which followed, and a vote of thanks was unanimously passed to Dr. POPE for his Paper.

The members present also expressed a desire that the Paper should be published in the forthcoming number of the Quarterly Transactions.

F. M. POPE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1891.

Jan. 12.—Sir William Wilson Hunter, K.C.S.I., C.I.E., M.A. (Oxon.), LL.D. (Cantab.)—"The New Leaven in India."

[N.B.—This Lecture will be given in the Temperance Hall.]

,, 26.—Rev. P. T. Forsyth, M.A.—"Tennyson's Idylls in their Epic Unity."

Feb. 9.—Prof. Raphael Meldola, F.R.S., F.R.A.S., F.C.S., F.I.J.C. (Professor of Chemistry in the Finsbury Technical College, City, and Guilds of London Institute)—"Coal Products: A Romance of Applied Chemistry." (Illustrated.)

,, 23.—A. H. Paget, Esq.—Recital from "Twelfth Night."

Mar. 9.—Prof. Oliver Lodge, D.Sc., LL.D., F.R.S. (Professor of Physics in University College, Liverpool)—"Electrical Waves." (Illustrated.)

, 23.—Bernard de Lisle, Esq., B.A.—"The Drama as a means of Education."

All Lectures commence at 7.30 p.m.

Charles J. Billson,
George Hull,
W. Simpson, } *Hon. Secs.*

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. William Simpson, 1, Brighton Villas.

Secretary—Mr. Jno. Scampton, 1, Pelham Street.

1891.

January 20.—Mr. Thos. Carter, L.L.B., "Elizabethan Music."

February 17.—Mr. C. J. Billson, M.A., "The Scriblerus Club."

March 17.—Mr. A. P. Moore, M.A.,

WILLIAM SIMPSON, *Chairman.*

SECTION "D."

Chairman—Rev. T. A. Preston, M.A., Thurcaston, Leicester.

Secretary—Mr. J. J. W. Knowles, 25, St. Stephen's Road, Highfields, Leicester.

Evening Meetings—The third Wednesday in each month, at 7 p.m., at the Museum.

1891.

January 21.—Paper by Rev. W. Agar, on "Heredity."

February 18.—Paper by Mr. Carter, LL.B.

March 18.—

Instead of any special exhibitions, there will be a discussion each evening on the books read during the month by the Home Reading Circle. Exhibitions will still be welcomed.

T. A. PRESTON, *Chairman*

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SECTION "E."

Chairman—Dr. F. M. POPE, Campbell House.

Vice-Chairman—MONTAGU BROWNE, F.Z.S., F.G.S., Town Museum.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1891.

January 19.—"Notes on malformations of the bill, in Birds," by Mr. W. P. PYCRAFT.
"On a Sea Pen *(Pennatula)*," by the SECRETARY.

February 16.—Author and title of Paper for this date will be announced at the January Meeting.

March 16.—Paper by the VICE-CHAIRMAN.

The paper for the evening will be read at 7-45, any business before the Section being then adjourned.

F. M. POPE *Chairman.*

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VOL. II.

PART VII., APRIL, 1891.

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1891.

[*Price Sixpence.*]

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1890-91.

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F. T. MOTT, Esq., F.R.G.S.

Vice-Presidents:

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J. D. PAUL, F.G.S.
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Retiring June, 1891.	Retiring June, 1892.
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Auditors:

E. CLEPHAN. T. C. LEE.

Four Co-optative Members of the Museum Committee of the Town Council, recommended by the Society.

H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.G.S.

Sections:

A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS,

Chairman, WM. SIMPSON.
Secretary, JNO. SCAMPTON,
1, Pelham Street.

D. BIOLOGY (BOTANY AND ZOOLOGY).

Chairman, REV. T. A. PRESTON, M.A.
Secretary, J. J. W. KNOWLES,
25, St. Stephen's Road.

E. ZOOLOGY AND GEOLOGY.

Chairman, F. M. POPE, M.B.
Secretary, F. R. ROWLEY,
Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1890-91.

JANUARY TO MARCH, 1891.

GENERAL MEETINGS.

January 12th, 1891.—Sir WILLIAM WILSON HUNTER, K.C.S.I., C.I.E., M.A. (Oxon.), LL.D. (Cantab.), on "The New Leaven in India." (Given in the Temperance Hall.)

The substance of this Lecture has been published in the February number of the *Contemporary Review*, under the title, "Popular Movements in India."

SIR WILLIAM HUNTER said he thought it was a sign of the times that so many of them should have come out on that cold winter's night to hear about India. It was not the India of romance and adventure of which he was going to talk, the old India of magnificent Rajahs, and jewelled lords, and mysterious temples, and huge wild beasts of the chase. It was not even the India of the East India Company, with its heroic battles, and rapid fortunes, and curious specimens of Anglo-Indian nabobs from Calcutta, at whose eccentricities they had so often laughed on the English stage. It was the new and commonplace India of our own day, where men were beginning to be moved by the same political aspirations which had made England what she was, where they were trying to solve their own hard social problems, and where the struggle for life was gradually disclosing itself to be a struggle between capital and labour, precisely as in our own land. It was the India of the railways and of the Factories Commission, the India of the great movement for bettering the condition of women, the India of the annual political congress—in one word the India of the Queen.

What had brought about this great change? It was the marvellous uprising of the Indian intellect, the awakening of the Indian activity and conscience, a vast revolution in thought and aspiration such as the world had never seen since the revival of learning in Europe. Thirty-five years ago such education as existed in India rested almost exclusively on a sectarian basis—conducted by the Brahmin priests, the ministers of the Mahommedan mosques, and the missionaries of the various Christian bodies. But during the last thirty-five years Indian education had been reorganised very much as it had been here, on a non-sectarian basis, and Government schools and colleges had been thrown open throughout the land to all our Indian fellow-subjects, irrespective of their caste, creed,

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or race. The result had been to create a system of public instruction based on Western knowledge and enlightenment, while the number of boys in the Government schools and colleges of India now amounted to three and a half millions. But the result was not chiefly a result of figures; it was rather the upheaval of new ideas, the quickening of new social and political forces, the decay of old fanaticism, the dismemberment of old cruel superstitions, and the death of the bad old pagan beliefs. This was the new leaven which was at work in India.

Sir William then proceeded to consider the nature of the changes this new leaven had produced. In the first place it had converted what was always before a hostile India into a loyal India—a thing which was impossible in the eyes of the governors under the East India Company. "Can we consolidate India?" That was a question to which the greatest administrators under the Company answered "No," but it was a question to which, under the Queen, we had answered "Yes." The great task of consolidation had been accomplished. It was the beneficent legacy which the past thirty years of the Queen's rule there handed down to the incoming century. The desire of the British subjects in India was no longer to get rid of the Government, but to be allowed to take a part in it. The task of the Government was no longer to crush out disloyal and rebellious forces, but to utilise the new forces which had been evoked in a consolidated and loyal India. Sir William gave several incidents in proof of his statement as to the complete loyalty of India. He referred to the Penjdeh incident and the munificent offers of help in men and money that came from the feudatory princes and the sympathy of the subjects under immediate British rule. Russia withdrew, but she found she had awakened an enthusiastic loyalty in India towards the British Government on which she had not reckoned. Sir William also spoke of the "outbursts of loyalty" in the Jubilee year, and with respect to the position of Russia in relation to India he quoted the following words from the President of the Indian Congress at Madras—a purely native and spontaneous gathering:—"If there were ever to arise, which God forbid, any great struggle between Russia and Great Britain for the supremacy in India, who is best able to judge of the merits of the two empires? It is we, the educated natives, that are best qualified to judge, because it is we who know and are best able to appreciate the blessings of British rule—the blessings of the right of public meeting, liberty of speech, high education, all these blessings which we enjoy under Great Britain, whereas probably under Russia we should have nothing but a haughty and despotic Government, whose chief glory would consist in vast military organisations, aggressions on our own neighbours, and great military exploits."

Sir William Hunter here incidentally explained that there were 250,000,000 people in India, of whom 200,000,000 were British subjects in British territories, and 50,000,000 lived under Indian chiefs—not directly our subjects, but under chiefs who owed us allegiance. As an outcome of this interest in British unity and supremacy of which he had

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spoken, there had been two movements. In the first place, there had been a movement among the feudatory princes to become more actively incorporated in the military defences of the country; and, in the second place, a movement among our own immediate subjects in India to be more actively incorporated in the work of the Government.

The question of questions for the Queen's representatives in India during the last five years had been—how far it might be safe to trust the princes and the people of India to help us in the defences of the country—how far it was safe to trust the native princes of the feudatory States, and how far safe to trust the influential classes in our own provinces. To both these vital questions the British Government had, during the past year, given a definite answer. It had boldly told the native princes that it had confidence in their loyalty, and did accept their free-will offerings of troops. The whole question was brought to an issue by the magnificent offer of the Nizam, the chief Mohammedan prince in India, who asked the British Government to accept a present of £600,000 to assist them in the frontier defence. Other princes followed with offers of money, men, and transport animals, and equipage of war. The Government had not seen fit to accept offers of money from feudatory princes, but they had accepted the large offers of transport animals and troops, and the reserve contingent from feudatory States that was being trained would, in a few years, add 25,000 men, unpaid by us, to the defence of the Indian Empire. These troops were maintained by the native States, commanded by the native chiefs, and had been highly praised by Lord Lansdowne, who reviewed them.

In the British territories the loyalty to the Government had taken another form—chiefly the National Indian Congress, consisting of delegates from the various provinces who met once a year to discuss the political needs of all India. They were unpaid, and elected by their countrymen to tell the Government what really was in their hearts, so that the ruling power was brought into contact with an authoritative expression of the wants and aspirations of the race it governed. This congress, among other things, asked that the liquor duty should be so administered as not to lead to the growth of intemperance, so that it might not scatter public-houses up and down the country. They asked that the British subjects in India should be allowed to bear arms as volunteers in defence of the empire, that taxation should be adjusted so as to bear a little less heavily on the poor—and as a consequence, he was afraid, a little more heavily on the rich. It was asked further that they should be more largely admitted to the public services which administered the affairs of the districts and provinces, that the House of Commons should exercise a more effective control over the Indian revenues and expenditure by taking up the Budget at an earlier period of the session instead of hurrying through it at the fag end.

Most important of all, the Congress asked for reform by which the subjects in India should have a more effective voice in making their own laws. Sir William Hunter proceeded to go into the latter request in

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detail. He explained the composition of the Viceroy's Legislative Council, and spoke of the demand of the Congress that the revenue and expenditure of the Indian Empire should be regularly discussed in the Viceregal Legislative Council, which he considered a reasonable demand, and also of the plea that members should have the right of asking questions of the Government. At present no member of the Indian Legislative Assembly could bring forward any business whatever without the consent of Government, nor ask questions as to alleged miscarriage of justice or any subject whatever. This was found, as he could tell them, from personal experience as a member of the Viceroy's Council, a substantial grievance and a serious inconvenience. The Indian Legislative Councils had now a quasi-representative character, but the natives asked the Government to allow them to elect a certain number of their own representatives. Sir William briefly discussed Lord Cross's and Mr. Bradlaugh's Bills, and said that the difference between the Government Bill and Mr. Bradlaugh's was no longer one of principle, but simply of degree. He believed before the end of this century England would have added to the many benefits she had conferred on India the great benefit of some form of representative government.

The last section of the lecture dealt with the "new leaven" as producing social and domestic revolution in the homes of the people. All great human movements advanced, not in one, but in many directions. In India it took industrial, political, and religious directions, and flowed into a hundred social and domestic channels. They could not let loose the mighty waters of knowledge in a country, and then command them to run only in one narrow channel. They had opened the floodgates of new moral and intellectual life in India, and the result was a new energy which was making itself felt in every department of thought. The new political activity of which they heard so much was only one of the many aspects of the great awakening of the Indian race. With regard to household life, the rising generation of younger men were becoming imbued with our ideas as to the position of women, and desired educated wives who should be real helpmates. This seemed a simple matter, considering the good girls' schools that were in India, and he was happy to say that there was a large proportionate increase in the attendance at them. But there were two causes at work hampering the progress of female education—the deep-seated prejudice against girls going outside their own homes after early years, and early marriage, which took many from school when they were but ten or eleven. The latter was a very serious obstacle which many earnest reformers in India were trying to overcome. Sir William dealt at some length with the question of child-marriage, and the restriction placed on widows by native prejudice in the matter of re-marriage. He showed the growth of the movement against early marriage, and the request that it should be forbidden by the legislature. He explained what had recently been done in this matter, but pointed out the difficulty the Government were

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un er, having pledged themselves repeatedly not to interfere with the people's family arrangements—pledges which materially helped to secure the native acquiescence in our rule.

In conclusion, the lecturer spoke of the appointment of one hundred delegates from India to come to England and lay the wishes of the people of India before the English on English platforms. Although it might not be possible for the English Government to grant everything they desired, yet the fact of the deputation coming from the far East formed a splendid recognition of England's position as the mother country of the great British Empire. Surely it made them realise not only the sense of the common interest which was growing up between India and England, but the confidence the people of India felt that they could lay their wishes for reform and their aspirations before the English with the certainty of a fair hearing and a fair consideration of their wants. It told us that India believed in the justice of Englishmen and the determination of England to do what was right and true to the great Asiatic Empire God had committed to her care.

January 26th.—The Rev. P. T. Forsyth, M.A., on "Tennyson's Idylls in their Epic Unity."

The Lecturer, after some preliminary remarks, said that it might be a surprise to some of them to hear the Idylls spoken of as a poem instead of a collection of poems. There was, it must be admitted, something unfortunate in the mode of their publication. They were issued first as isolated poems on the several personages or incidents of the Arthurian cycle, and it was some time before the public became aware that they were really the books of what, without exaggeration, might be called a national epic, an epic worked out with an amount of structural power with which the poet had not been credited. Probably the author would be prepared to stake his reputation as a poet, prophet, and thinker upon two works—"In Memoriam" and the "Idylls." They were each of them epic in their nature, and each of them, like the Iliad itself, composed of facts rather than chapters. In both cases the design of the whole was more latent than expressed. The casual reader was not carried on, as from chapter to chapter of the novel—the unity and the development were the growing unity of a moral and spiritual idea. More than most Tennyson was a spiritual poet, and probably was the first truly spiritual poet who had held in conjunction with that gift a gift of colour and luxury of form worthy of Keats. "In Memoriam" might be called the epic of the soul. "The Idylls" the epic of the State. The first was the epic of the individual soul in private grief; the second of society, of public order and public wrong. The first described in lyric succession the conquest and annexation of sorrow the second was the conquest of a social realm, and it dealt with the disorder of individuals only in relation to the disruption of the State. The first was the conquest of evil taken in the sense of loss or pain; the

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second of evil in the sense of sin and crime. In the first Tennyson was the private and saintly poet; in the second he was the public and prophetic poet. Both poems, however, were epics; both rang with battle and victory, but it was a conflict with spiritual powers in high places. And the note of both was the strain of victory. They closed in triumphant music of an awful sublimated sort, distant, muffled, mystic, the far sound of harpers harping on their harps in the celestial city. Two questions arose in the title—why the "Idylls" and why "The King." In respect of the first question some criticism had been spent on the use of the word idyll. It was certainly a novel and a somewhat strained use of the word. But the reason for Tennyson's use of it might be twofold. He knew that in the proper idyll he was at his best and strongest, and in the second place it was possible that he distrusted his own power to construct the entire poem as it rose before his mind, and that, therefore, he not only published its parts in the irregular fashion referred to, but actually gave them a title more misleading and isolating still, under cover of which it would be easy to escape criticism if they did not, when finished, fall into the complete unity designed. But there might be a further reason for the use of the name of idylls. The idyll was pre-eminently associated with the simplicities not only of nature, but of sweet love and homely life, the purity of the hearth, the sacredness of the family. Now this great social poem was a poem of the hearth and home, and it was treated for the most part in a style of the most perfect and inimitable simplicity. It was a poem of the purities and sanctities of the domestic life. Public as was its scope it turned entirely upon them. The king and his realm were ruined because those purities had been violated; the woman, the shrine of these holy things, became herself desecrated, and as a consequence all the kingdom, slowly saved from lawlessness, "reels back into the beast and is no more." The whole drift of the poem—and herein it was a mirror of its age—was this: That the noble man, the noble society, the prosperous and blessed kingdom, were ultimately dependent on that delicate purity and sweet sacredness of soul which were canonised in the faithful names of mother and wife. There was plenty of evidence in this poet's work to show that he was highly concerned about the new claims made for women in the society of the day. No poet since Shakspere had been so successful in drawing English women of the gentlest, sweetest, and purest type. Prizing that type as he did, it was not wonderful if Tennyson felt on the one hand the enormous influence which it was bound to wield as society rose in culture, and on the other the extreme danger of its disappearing or becoming tainted as it shared this culture and developed in a public direction. The woman's soul was a more delicate fabric than the man's. It fed on a rarer air. Its pulses were more rapid if they were less strong. Infection was more quickly spread throughout the organism, and once on fire the flame flew to the edge of the gossamer like a flash. It was in this subtlety of structure, if she but knew it in her day, that the woman's true power lay. It was this ethereal lightness that had

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enabled her to float upon the surface of the rising tide of a religion like Christianity, whose specific power was the conquest of the mighty by the lovely, the strong things of the world by the things which seemed weak, but were really instinct with the silent omnipotence of reserved divinity. And a poet like Tennyson dreaded the unbroken contact of the world with a product so fine. Woman, he said, was emerging from the shelter under which these rare qualities had grown up. She was coming to face the world, mix in its interests and activities, and meet the forces of its currents without the protection of those piers and breakwaters which had defended her for so long. The fierce light of publicity was being permitted to fall on the woman's throne, untempered by that seclusion in which so much of the woman's mightiest influence had been reared. And there was danger to this poetic and prophetic eye that the delicate colour might fade in the glare, and the fine metal by exposure grow dim. The women of to-day had two dangers—the first arising from the new facilities and encouragements for intellectual culture; the second from the enlarged social freedom and invitations to indiscriminate publicity. As the danger was twofold so was the result. The new conditions might make a woman an independent blue-stocking, as harsh in mind as she was wiry in frame. That had its ridiculous side. But these same modern conditions might act otherwise on the woman of another type, a higher order and a richer promise. They might invite her to a development of passion, not gross but self-willed, a freedom of choice, a defiance of social bonds which became nothing less than immoral. There was nothing ridiculous about this. It was purely tragic. Unfortunately, too, there was nothing imaginary in it. The result was too real, actual, historic, nay, visible, ominous in our very midst. And unless things changed for the better, and some regenerative power transformed the highest society of our time, these "Idylls" which were now poetry would soon become prophecy, and a little longer still and they would be history. The sanctity vanishing from the family would take its flight also from the society, and England would cease to be a power if English women ceased to be sweet and pure.

Mr. Forsyth proceeded to sketch and comment upon the characters of Guinevere and the King as unfolded in the Idylls. But there was, he said, more in the poem than Arthur, and more than individual concerns. Arthur was but the centre of a social world. There was more than a soul, more than a character pourtrayed There was a society, a realm. The poem was not a religious symbol only; it was moral in its inspiration as well; it dealt not with the consequence for the individual only, but with the consequence for the realm.

The Lecturer then asked the audience to trace with him the development of the moral idea in the decay of the kingdom, spreading gradually from the King's foe in his own household to the demoralisation of court and realm, the poisoning of all the finer forms of life in home, art, and religion, and the final dissolution of the entire organism. In "The

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Coming of Arthur" there was not the slightest indication as yet of the sin and sorrow soon to begin. So carefully was this kept out of view that it was only from a later poem that they discovered how the seeds of mischief were sown in the first meeting of Lancelot and Guinevere. The next poem was "Gareth and Lynette." Here, too, there still rang the note of victory and fair promise, but in "Enid and Geraint" the little white cloud of the size of a woman's hand rose above the sea. Rumours of the guilty love of Lancelot and the Queen began to flit about the court, and its first effect was to poison the simplicity of a home. Although between Enid and her husband the old entirety of trust was renewed, yet this poem showed the taint had begun, and the first effect of the Queen's sin was upon the home—though not first her own. They must notice that the innocent began to suffer before the guilty, the victims of the sin felt it before the culprits, and further how it was the finest forms of life that first came within the range of the fatal contagion. The next to give way, following the order of the poems, was the artist—first home, then art, that was the significance of "Merlin and Vivien." The realm grew Frenchified. It became a "second empire." Art and science were alike corrupted, nay, already dead, because they had parted with their loyalty to moral conditions. "The Lily Maid of Astolat" was the next victim of the subtle plague, and they obtained in "Elaine" the first close glimpse into the relations of Lancelot and the Queen. Up to this point they had seen sweet love slain; true confidence gone; home, home no more; science and art demoralised and ruined. The next to suffer was religion—that was the meaning of "The Holy Grail." Religion, ceasing to be ethical, became fanatical. Duty was neglected for the quest of wandering fires. Men who were meant to do sturdy and sober work in life went off in mad search of a hectic spiritual exaltation. The value of this idyll for the religious teacher was almost inexhaustible. Home, art, science, religion were undermined—nothing was left to be ruined now but the outward social order which Arthur had built up at such cost and danger as the work of his life. The lecturer proceeded to trace this in "Pelleas and Etarre" and "The Last Tournament," dealing at some length with criticisms which have been passed upon the latter poem. Then he spoke briefly upon "Guinevere," remarking that he hardly ventured to speak of its tender, solemn, and subduing power. There was little in literature to compare with the parting scene between the King and Guinevere. It was more than literature—it was a kind of Holy Writ in the religion of humanity. There was little now for which Arthur should live. Well had he said to the Queen—

> "Thou hast not made my life so sweet to me,
> That I the King should greatly care to live."

But there was still the duty of defending against the army of Modred what order remained.

Mr. Forsyth dealt lastly with "The Passing of Arthur"; and, after briefly summing up the lessons which the Idylls, considered as an

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epic whole, convey, he concluded by reading three extracts. The first was the marriage ode in the first Idyll, the second the meditation at the opening of "The Passing of Arthur," and the third the concluding lines of this poem.

February 9th.—PROFESSOR RAPHAEL MELDOLA, F.R.S., F.R.S., F.I.J.C., on "Coal Products—A Romance of Applied Chemistry."

The Lecturer said that the romance he had undertaken to spin that evening was to be woven out of very prosaic material. It was the romance of dirt. It was to be spun out of that familiar substance coal. Before a Leicestershire audience it would be almost presumption to suppose that they required telling about the origin of coal, but he might just remind them that coal was the fossilised vegetation of a past period in the earth's history. He was sometimes asked how it was that they so seldom found evidence of the vegetable structure of the coal itself, and the reason was that it had been lost owing to the mechanical and chemical changes through which it had passed in the course of time. But in grinding very thin sections, the vegetable structure was revealed, and in the various mineral deposits occurring between the seams of coal they had more distinct evidence of vegetation which flourished in the carboniferous period.

After showing on the screen drawings of specimens of this kind, the lecturer explained the chemical change which occurred to the woody fibre when buried under the ground—how it loses in hydrogen, oxygen, and nitrogen, and gains largely in carbon. It was not necessary, before the Literary and Philosophical Society, to speak of the doctrine of the conservation of energy. If a substance gave out heat it must contain latent energy, because heat was a form of energy by virtue of which they were able to do work. The amount of heat given out by coal had been accurately measured. The calorific value was stated to be 13,890 units, which meant that one pound of coal contained sufficient heat to raise 13,890 lbs. of water through one degree Fahrenheit. Translated into power of work, that amount of heat would be capable of raising a one-pound weight to a height of 10,000,000 feet. If they transposed it to horse-power they found it corresponded to $5\frac{1}{2}$ horse-power per hour to be got out of a pound of coal. But in practice they did not get anything like that amount of work. In the best possible steam-engine they only got one-tenth. Their use of coal was not at all economical.

In London they burnt 9,709,000 tons of coal annually, and some years ago there was an agitation—which he hoped would continue—about the state of the atmosphere. Experiments were made to test the amount of unconsumed carbon particles which went up the chimney in the present form of domestic grate, and it was found to be from one to three per cent. of the total amount of coal used which escaped in the form of soot. Taking the lowest estimate, this meant that there goes into the atmosphere of London in the form of soot 266 tons per diem,

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which apart from other considerations was a wicked waste. If instead of burning coal in an open grate they heated it in a closed vessel it underwent a process of destructive distillation, and gas was one of the products.

A Scotchman named Murdoch lighted his house with coal gas in 1792, but it was not until 1813 or 1814 that it was permanently introduced into the streets.

The lecturer threw on the screen a section of a complete apparatus used in the manufacture of gas, and pointed out the various processes through which gas passed during its manufacture, drawing special attention to the manner in which the tar was deposited. One ton of coal gave 10,000 cubic feet of gas, 12 gallons of tar, 30 gallons of liquor, rich in ammonia, and 12½ cwts. of coke. They distilled annually in this country ten million tons of coal in gas making, which gave them 550,000 tons of tar. The Professor then gave a history of the residual tar, and said that in 1822 two doctors started a tar distillery in Leith, before which time tar was regarded as useless. One of the first products obtained by this distillation was the volatile benzene which Mackintosh started to use to dissolve indiarubber in the manufacture of waterproof materials. That was at first its only use. In 1838 an enterprising person took out a patent for using the heavier tar oils to creosote timber, by which method it was preserved from decay when placed under the ground or in water. From that day the distillation of tar became an important industry, and, with a perfected process, creosoting timber was now carried on on a colossal scale. At the present day use had been found for many other products of coal-tar than those he had mentioned.

The lecturer then explained in detail the process of tar-distilling, and touched upon the nature of the "first runnings," light oils, creosote oils, and anthracine oils that came off, and the pitch that remained in the still. There had been discovered in tar at least 150 distinct chemical compounds, and probably there were in it as many more. In the hydrocarbons there had been discovered a mine of wealth in colouring matter. Mauve was the first to be found out in 1856, and it was followed by many others, so that the art of the dyer had been revolutionised. Indeed no branch of the tinctorial industry could dispense with the use of coal-tar colouring matter. Professor Meldola showed the audience specimens of the innumerable tints of these dyes, among them specimens of dyed silks of all the colours of the spectrum. He remarked on the fact that the colouring matter of madder was now obtained from the anthracine, so that the madder culture had been practically extinguished. The colouring matter of indigo could be also obtained, but at present it was cheaper to get it from the plant. There were indeed 300 distinct colouring matters to be got from the coal-tar products. On the question of their fastness he had already spoken of two of the fastest of best known colouring matters in the world which could be got from coal, but

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of the 300 dyes about 30 were absolutely fast, and another 30 were very fairly so. As out of the dyes obtained from natural vegetable products there were 10 which might be said to be fast, the coal-tar industry could claim to have trebled the number of fast dyes.

Coming to the many other products obtainable from coal-tar, the Lecturer said that it was the source of all sorts of ammonia compounds used in manufacturing. About 134,000 tons of sulphate of ammonia were obtained at the present time, equalling a monetary value of £1,600,000, so that the nitrogen stored up in the old plants, which formed the coal, in the carboniferous period, was no mean legacy.

The Lecturer spoke next of aromatic perfumes, of bitter lemon oil and vanilla flavouring derivable from the same once-despised tar, and also of saccharine, which was three hundred times sweeter than cane sugar. Finally, he alluded to products useful in pharmacy, many of which had found their way into the pharmacopœia, and to uses of other products in photography. He wished them to understand, however, that these things were produced by the chemical transformation of the materials found in tar. They were not contained in the tar itself. These results represented the work of some of the highest chemical talent in the world, concentrated for twenty-five years on this particular branch.

February 23rd.—Recitation by A. H. PAGET, Esq.: "Shakspeare's Twelfth Night."

March 9th.—Professor OLIVER LODGE, B. Sc., L.L.D., F.R.S., on "Electrical Waves."

Professor LODGE said that to persons occupied in other branches of learning, and not directly engaged in the study of physical science, some rumour must have probably travelled of the stir and activity manifest at the present time among the votaries of that department of knowledge. It might serve a useful purpose if he tried to explain to outsiders what this stir was mainly about, and why it existed. There was a proximate and an ultimate cause. The proximate cause was certain experiments exhibiting in a marked and easily recognised way the already theoretical and predicted connection between electricity and light. That was mainly what he should have to speak about that evening. The ultimate cause was that they were beginning to feel inklings and have foretastes of theories wider than that of gravitation, more fundamental than any theories which had yet been advanced, theories which, if successfully worked out, would carry the banner of physical science far into the dark continent of metaphysics. They were beginning to see chinks of insight into the nature of matter, of electricity, and of the ether. They were living, not in a Newtonian era, but in a perhaps greater Thomsonian era, greater because not any one man was probably greater than Isaac Newton, though, indeed, a century hence it might be premature to offer

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an opinion on such a point, but because of the momentous nature of the problems involved. There were a dozen men of great eminence, either now living or recently deceased, to whom what they knew about these generalisations was in some measure due, and the epoch of development might hardly be seen by those now living. It was proverbially rash to attempt prediction, but it seemed to him it might well take a period of fifty years for these great strides to be fully accomplished. If it did, and if the progress went on at anything like its present rate, the aspect of physical science bequeathed to the latter half of the 20th century would indeed excite admiration, and when the populace were sufficiently educated to appreciate it, would form a worthy theme for poetry, oratorio, and great works of art. To attempt to give any idea of the progress in all the directions he had hastily mentioned would take too long, and he must limit himself to some slight skimming of the ground concerning the relationship between light, electricity, and the ether. For now nearly a century they had had the wave theory of light, and that theory was in some sense certainly true. Light did consist of waves—waves travelling at a rate which was perfectly well known, at a rate which was very great—sufficient to encircle the globe seven times in the space of a second. But, although so extremely rapid, a certain time was taken in the passage of the waves. In its journey from the sun light took eight minutes, coming through what they called an empty space. But if light consisted of waves there must be some medium to carry those waves—a medium which was thrown into waves and thereby brought us light. That medium which existed used to be called luminiferous ether, though now they had dropped the qualifying adjective because it was known to-day that the ether did other things besides causing light. It was the fundamental medium of magnetism and of electricity, and to the physicist nothing was more certain at the present day than the existence of the ether, which, at the beginning of the century, was doubted. What was meant by the word wave—waves of light? He supposed the ordinary notion of a wave was that of the waves of the sea. That was one kind of wave, but there were other kinds—sound waves, light waves, heat waves, and now they were beginning to speak of electrical waves. In all cases the term had a perfectly definite meaning, though in no two cases was the meaning exactly the same. Whatever was periodic in space and time was to be called wave-motion. In order that a medium might transmit wave-motion two qualities were essential—elasticity and inertia. In 1865 Clark Maxwell propounded the theoretical connection between electricity and light, and he showed that, from what was known concerning electricity, the ether possessed the two properties needed in order that it might convey waves—elasticity and inertia or density.

The Professor then proceeded to go into detail on the subject of electrical waves, and illustrated his remarks with some very striking and successful experiments. He explained the lengthening and shortening of the waves, and the velocity of vibration, and spoke of the limitation

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of the power of the retina in the eye, which was "tuned" to respond only to excessively short waves. One of the best appreciated experiments was that showing the existence of the radiations which the eye cannot perceive. Electrical oscillations were the fundamental cause of light. Light was the electrical disturbance of the ether; optics were discovered to be a branch of electricity, and now outstanding problems in optics were being rapidly solved. Ordinary light was the result of electrical oscillation in the molecules of heated bodies, but the proper way to get light would be not to heat the body to secure this oscillation: some form of phosphorescence would probably be the light of the future. The direct generation of visible light of the proper kind by electrical means would have most important consequences, for their present modes of artificial light were costly and ineffective. To make the atoms vibrate the only way they knew now was to heat the substance, and then they did begin to vibrate for reasons best known to themselves, and they gave light of the proper kind. But only about five per cent. of the total radiation from these flames was useful—the rest was simply unpleasant and made heat. The electric light was the same kind of method as the others, only the heat was produced by the electric current, which gave a higher temperature and more light in proportion to the waste power. Anyone looking at a glowworm must have been struck by the fact that not by any process of ordinary combustion was his light produced, and it had been decided that the glowworm's phosphorescent light consisted only of radiations which affected the human eye. As soon as they clearly recognised that light was an electrical vibration they would beat about for some mode of obtaining that electrical vibration of any required degree of rapidity, and when that was accomplished the problem of electric-lighting would have been solved.

March 23rd.—BERNARD DE LISLE, Esq., B A., on "The Drama as a Means of Education."

Mr. DE LISLE said that they were, perhaps, a somewhat prosaic nation—at least they had that reputation abroad. They thought deeply, and worked industriously, were calm, calculating, and clear-headed, and did not easily allow themselves to be carried away by the excitement of the moment. They reasoned, but they were supposed to be wanting in the power of imagination, and so as a nation they were held to be undramatic. Yet they had produced the greatest dramatic poet the world had ever seen. Was it a mere freak of nature, however, that Shakspere was born an Englishman? Certainly his countrymen, of all civilised peoples, had paid least attention to the stage, and had never looked on it as a national institution. In ancient Greece public money was put aside for dramatic representations, which could be attended by the poorest, and they took the form of competitions between rival authors; and France, in the 17th century, established a national theatre,

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and to this they owed to a large extent the high standard of their dramatic literature. Germany, more recently, had made a great deal of its stage, but in England the State had never taken the theatre in hand, and the English theatre fell into bad hands in consequence. People opened theatres, not with the intention of educating the people, but with the hope—often delusive—of making profit, and the Puritan spirit of the middle classes became much shocked by the result—not without cause—and looked on the theatre as an invention of the devil. In Germany, however, the drama had been recognised as an educational and even a nationalising force by the statesman and the lawgiver. Five years ago, after the expulsion of the Poles from East Prussia, one of the means of Germanising the provinces was the subsidising of theatres to produce plays in German. Both the State and municipalities took the drama into their own hands, seeing in it a potent engine for influencing the public.

After some detailed reference to the Greek drama, Mr. de Lisle went on to say that the power of the drama came from its capability of interpreting with unerring exactness every phase of human nature. The drama must always hold an attractive influence over the public, for it was the temple in which all the arts might unite. This was peculiarly the case in ancient works. In later times sub-division had taken place, and the theatrical art had been divided into many arts. Opera had been made a special art of its own. Comedy had been separated from tragedy. Originally all were united into one.

There were many ways of cultivating the mind besides reading books, but there was not one where so much result could be obtained with so little trouble as witnessing a classical play well performed and well put on the stage. Mr. de Lisle pointed out how especially this was the case with scenes from history, which, as represented on the stage, not only vividly impressed on the mind the chief events of the time, but the manners of private life, the religious observances of the people, the government of the State—in short, all and everything was placed before the intelligence, which was strained to the utmost effort. The governing bodies in Germany had seen this. They had made the stage a public institution, and at the same time as they reduced the prices within the reach of all they freed the stage manager from the necessity of only having such pieces in his repertory as he thought would pay. The same system could be applied in many ways. In England it might be potent in recalling to their minds some of the most glorious events of their history.

If they were not a dramatic nation they at least possessed one of the greatest dramatists. In the works of Shakspere they had an inexhaustible store of wealth, of which the Germans said they were altogether undeserving. Curious as it might seem, the Germans knew Shakspere better than they did. They had his works admirably translated. They had studied them with the same ardour we devoted to Sophocles, and Shakspere's plays had been represented again and again

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throughout the Empire. How intensely interesting a series of lectures on English mediæval history would be if illustrated on alternate nights by representations of the historical plays of Shakspere. It would be a gigantic undertaking to attempt such a thing. Would it be possible?—that is what they wished to discuss. Perhaps the undertaking would be altogether too big, but they might reduce the period to be covered to that of the House of Lancaster.

After a somewhat detailed reference to this period, to Shakspere's plays covering it, and to its suitability for the treatment he described, Mr. de Lisle briefly spoke of the French stage. He went on to say that he did not by any means wish to narrow down the question to one which appertained to history alone. The study of Greek civilisation was as interesting, and almost as important for a great democracy such as England was now becoming. The Athenians were the most commercial, and, at the same time, the most cultivated and artistic nation of antiquity. In many points their constitution was more perfect than our own. Their literature and philosophy were unrivalled. Why should not the Athenian civilisation be studied in the same manner—why not a series of lectures illustrated by representations of the Greek plays translated? The production of the Greek play would do more to bring home to the people of the present day the glories of ancient civilisation than the perusal of many books. But he admitted that the scheme would not be a paying one. The stage, before it became generally useful in this country, as it was abroad, would have to be freed from the thraldom of the god whose trinity was £ s. d., and this was the first change needful before they could hope to have a school of dramatic literature.

Mr. de Lisle proceeded to lament that so many of the finest plays in English were lost in oblivion, except to those who would read them—a mode of study for which they were not intended. Finally, he said that the plan of lectures illustrated by theatrical representations as a means of public education might be open to objection. It might sound impossible at our present stage of existence. It was unquestionably an ideal, yet what was looked upon as a mad scheme yesterday was often a fact to-day. He was anxious that the resources at their command should be utilised. It seemed a pity that they alone should derive so little benefit from their national classics. He left the subject in full belief that if something were done on the lines indicated the result would be a threefold benefit—to the public in general, to those who had made the stage a profession in particular, and as a stimulant to the progress of their dramatic literature in the future.

A discussion followed the paper.

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THE STUDY OF PHILOSOPHY.

By A. P. Moore, B.C.L. (Read before Section "A.")

Lucian, in one of his wittiest dialogues, represents a man of the world meeting an old friend who had been devoting himself for twenty years to the study of philosophy and asking him when he hoped to attain the end of his arduous labours. The student replies that he hopes to reach the promised land in another twenty years or so, and that when he reaches it the vision of truth will repay him for all his toil.

"Riches and glory, and all pleasures of the senses are stripped off and left below, and man ascends like Hercules from the pile on Mount Æta. They who are purified by philosophy, as though by fire from the love of all those things which men in their ignorance admire, attain the summit and there enjoy all happiness, remembering no more either riches or glory, or pleasure, and smiling at all those who still believe in their existence." His friend, Lycinus, retorts with the insinuation that Stoic philosophers are no better than other men, and by his clever dialectic forces the student to admit that all the myriad guesses at truth may be wrong, and that life is too short to be wasted in endless speculations. He resolves to devote himself henceforth to the performance of his duties as a citizen, and to the pursuit of the pleasures of the world, and makes a vow to avoid a professor of philosophy as he would avoid a mad dog. Lucian represents in his clever fashion the popular prejudice which is nowhere stronger than in England against philosophical speculation.

The poet Gray, declines, in one of his letters, to embark on the study of metaphysics, on the ground that he had not the eyes of a cat to see in the dark. It is a common objection to philosophy that it unsettles everything and settles nothing. And indeed there can be no final solution of metaphysical problems, and the strife between the combatants can never be decided. And in this very fact lies the value of the study. We must make the questions our own by diligent personal effort, and strive to decide them for ourselves. We cannot evade metaphysics. We cannot avoid having somewhere latent in the background of our minds some doctrine about the conditions of the knowable, some kind of theory, however immature and inarticulate, of the relation of man to the universe, and of spirit to matter, and the crude and floating notion may crystallise into definite thought at some crisis in our lives with power to brace or paralyse our energies, to depress or console. Whether we are to philosophise or not, says Aristotle, we must philosophise. It is not uncommon to find men admitting into their minds shallow and

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barren interpretations of the problems of life, supported, as they suppose, by the irrefragable evidence of natural science, while, at the same time, they turn to reflective poetry for the deeper views of life which they would fain cherish. For a philosophy of life we may indeed turn to Rabbi Ben Ezra and Easter Day and for the spiritual element in nature to noble passages in Wordsworth. But when we sit down in a calm hour, no longer enthralled by the charm of the artist, the haunting impression returns that the beautiful visions of the poet are but shadows cast by desire. The light that never was on sea or land fades away, and only leaves us in deeper gloom.

Wordsworth's most perfect poem, the "Ode on Intimations of Immortality" is a beautiful restatement of the Platonic myth of reminiscence. It has a profound meaning for us if we believe in what Professor Green calls the eternal consciousness of man coming into being through organic processes in time and space, and awakening gradually to a knowledge of the principles implicitly contained in it. Otherwise, that is to say if the spirit of man be merely an animal consciousness analysable into a congeries of sensations, it is only a beautiful illusion. We must endeavour to find some warrant in reason for those ideas which the intuition of the poet sees, and to examine the preconceptions of science and ascertain whether the results do not require to be reinterpreted in the light of the higher categories of the mind. And there can be no better training than sustained thought about the subjects most worthy thought, and of most enduring interest for all thinking beings. Doubt may be born of the search for truth, but there is a virtue in honest doubt. The poet who made a life-study of the development of the human spirit says, "When the fight begins within a man, a man is worth something," and

> "I prize the doubt
> Low kinds exist without
> Finished and finite clods
> Untroubled with a spark."

Another common objection is that philosophic speculation unfits a man for the practical duties of life. In the picturesque language of Ruskin "metaphysicians and philosophers are, on the whole, the greatest troubles the world has to do with. Busy metaphysicians are always entangling good and active people and weaving cobwebs among the finest wheels of the world's business. They are as much as possible, by all prudent persons, to be brushed out of their way like spiders and the meshed weed that has got into the Cambridgeshire canals and other such impediments to barges and business." But there never was a race on the earth in which philosophical speculation is less likely to interfere with interest in, and capacity for the business of life or to degenerate into mysticism than the English. The defender of philosophic doubt discharges with universally acknowledged ability and energy the duties of one of the most difficult posts in the world. Such men are far more common in England than men of the type of that German philosopher who said, "Life is a

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very perplexing affair, and for my part I will spend it in reflecting upon it." The danger is rather that we allow the cares and troubles of daily life, which, as Coleridge says, are very useful as a hedge of thorns to keep out sloth, to overrun and choke the garden of the mind. Lucian's satire, however, by no means exhausts the list of objections against philosophy. One hindrance arose with the spread of the religion which he despised. In his day philosophy was still the most flourishing of all studies, and was the crown of all education and culture. But philosophy had not merely an educational value. It was still in touch with real life and conduct. Men looked to professors of philosophy for guidance, and an Epictetus or a Seneca were called upon to give advice and consolation in affliction or adversity. It may be true that the mass of these philosophers were, as Bacon hints, trencher philosophers and solemn parasites; and the retort of Diogenes to those persons who asked him why philosophers courted rich men, and not rich men philosophers, that the one sort knew what they wanted while the other did not, does not always carry conviction. Still the fact remains that men with serious views of life sought in philosophy, and nowhere else, for a rule of conduct. Greek philosophers assumed that man must seek his highest good on earth, and it was their chief business to inquire what kind of life was intrinsically preferable to all others, and to point it out when found. It was one of the results of the rise of Christianity to abolish, as was thought, the necessity of any such inquiry as being not merely useless, but impious, and to substitute for the pursuit of the *summum bonum* unquestioning obedience to a moral code, supported by penal sanctions and rewarded by a future life of happiness. The early Greek Fathers of the Church did, indeed, recognise a kind of divine revelation in the philosophy of the Greeks, which was a stepping-stone to the philosophy of the Christian faith, and as has been said, Christian teachers did not lay aside the philosopher's mantle in virtue of their office, but rather assumed it. Apologists appealed to noster Seneca, and the reflective morality of the Stoics was regarded as preparatory training for the Christian faith. Ecclesiastes and the Book of Wisdom, which most clearly exhibit the points of contact between Greek philosophy and Hebrew theology, were recommended as an introduction to Scriptural truths.

But the aversion of the Latin mind from abstract speculation, and the organisation of the great spiritual Empire of Rome, altered the attitude of the Church towards philosophical inquiry. The truths of religion and morality in mediæval times were regarded as a lesson to be learnt by rote, and as a code of law in the exclusive possession of a body of authorised teachers. Reason was only privileged to deal with knowledge of the finite world, and all intrusion into the sphere of theology was resented as an invasion of sacred ground. Such an attempt to fetter human reason necessarily proved futile. St. Anselm vindicated his title to a place among Christian thinkers by his endeavour to place the belief in the cardinal doctrines of the faith upon a rational basis. St. Thomas

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Aquinas recognised a natural theology which could demonstrate by reason the existence of God and the immortality of the soul. It was, however, of the essence of Rome's pretensions to claim an unquestioning acceptance upon external authority of a body of truth confided to an infallible Church. So long as this claim was acknowledged philosophy could only be the *ancilla theologiæ* employed to elicit the truths contained in Christian dogmas. But with the Protestant insistence upon the necessity of an inward acceptance of religious faith as binding upon the reason the need of a philosophy of the Christian faith is at once apparent. No doubt the attitude of Christian philosophers to speculation in matters of faith is even now not uniform, some, like the late Dean Mansel, insisting on the impotence of the human reason; others, like Coleridge, in his "Aids to Reflection," essaying to prove the perfect rationality of Christian doctrines. But natural and revealed religion admittedly rest on a common basis, however much theologians may insist that natural religion is useless without revealed religion as its complement. Even Cardinal Newman, while he denounced philosophical speculation because of the all-dissolving scepticism of the intellect in religious inquiries, declared that Christianity was addressed, both as regarded its evidences and its contents, to minds which are in the normal condition of human nature as believing in God and a future judgment.

If, therefore, men are without these beliefs, the only way open to them lies, in his opinion, in recourse to reason, which, he believed would, unaided, if correctly exercised, lead to a belief in God, the immortality of the soul, and a future retribution. Religion and philosophy have both the same end in view in that both endeavour to rise above the sensible and particular, and to bring us in contact with realities. Kant thought the function of metaphysic was performed in showing the phenomenal character of the objects of science and demonstrating the reality beyond phenomena of God, freedom, and immortality. Whatever we may think of the validity of the method by which Kant endeavours to transcend the absolute limits which he himself fixes to human knowledge, the first step in philosophy is to learn from him that the world is not a thing which exists in independence of the mind that knows it, and that the world of experience is, in fact, ideal. Common sense, which habitually treats as realities things which have demonstrably no existence in and for themselves, must first be disturbed and overthrown before any philosophic explanation of things is possible. The first object of the study of philosophy seems to be to reawaken that sense of wonder in which, according to the greatest of philosophers, philosophy began. We are case-hardened, as Browning says, by time and earth, and we do not seek to inquire what is behind "the veil and curtain of sense."

"Custom lies upon us with a weight heavy as frost and deep almost as life." As Carlyle says in one of his essays, "Nature, like a kind mother, strives to hide from us even this, that she is a mystery. She will have us rest on her beautiful and awful bosom as if it were our

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secure home. On the beautiful and boundless deep, where all human things fearfully and wonderfully swim, she will have us walk and build, as if the film which supported us, which any scratch of a bare bodkin will rend asunder, any sputter of a pistol-shot instantaneously burn up, were no film, but a solid rock foundation. For ever in the neighbourhood of an inevitable death, man can forget that he is born to die, and of his life, which strictly meditated, contains in it an immensity and an eternity he can conceive as a simple implement wherewith to do day labour and earn wages." "The world is too much with us," and philosophy, in Cowley's language, is a retreat from the world as it is man's, to the world as it is God's. Philosophy is in one aspect an attempt to find the supernatural in the natural, and to create (to use Bacon's phrase) a kind of sabbath and haven in our contemplations. And the search for truth should not be delayed till we have settled into a life of custom and accident, allowing external influences to mould us as they will, and floating on the stream of circumstance. Eadmer's life of St. Anselm, quoted by Dean Church, gives St. Anselm's opinion on the subject of the age for spiritual education, and the metaphor, however trite, states the truth. "St. Anselm compared the age of youth to wax fitly tempered for the seal. For if the wax be too hard or too soft, it receives but imperfectly the impression. So is it with the ages of man. You see a man from childhood to deep old age busy with the vanities of this world, minding only earthly things, and hardened in them. Talk to him of the things of the spirit, of the refined thoughts of divine contemplations; teach such a man to search out these secrets of heaven, and you will find that he has not even the power of knowing what you mean. And no wonder, the wax is hardened. He has not spent his life in these things, he has learnt to pursue their opposites. Take on the other hand, a boy of tender age, not able to discern either good or evil—not even to understand you when you talk of such things—and the wax is too soft and melting, it will not retain the impression. The young man is between the two, fitly tempered of softness and hardness. Train him up, and you may mould him to what you will." The history of philosophy is the record of attempts made by earnest thinkers, on whom the mystery of the universe pressed as a burden, to get some glimpses of its ultimate meaning, and the place and function of man in it. Plato's ideal philosopher is a man who turns from the masques and shadows of sense to eternal verities and finds peace in the contemplation of an absolute good, which implicitly contains all particular goods, including practical virtue. But the ideal picture drawn by Plato and Aristotle of the satisfaction of the highest human faculty in the contemplation of truth acquired, contrasts painfully with our experience of our laborious search for truth as it continually eludes our pursuit. There is a profound truth in the words of Ruskin, "Our happiness as thinking beings must depend on our being content to accept only partial knowledge, even in those matters which chiefly concern us. If we insist upon perfect intelligibility and complete declaration in every moral subject, we shall

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instantly fall into misery of unbelief. Our whole happiness and power of energetic action depend upon our being able to breathe and live in a cloud, content to see it opening here and closing there, rejoicing to catch through the thinnest films of it glimpses of stable and substantial things, but yet perceiving a nobleness even in the concealment and rejoicing that the kindly veil is spread where the untempered light might have scorched us or the infinite clearness wearied." But there is a great difference between a patient acquiescence in the inevitable limitations of human reason and the belief in the impossibility of a metaphysic of ethics and acceptance of the results of popularised science as applied to the study of man, which would logically exclude those deeper views of life which lie at the root of all religion and poetry. The great problem of to-day is, in what sense can we apply the idea of evolution to the spirit of man? Do all questions affecting man fall within the province of natural science? Can we treat the phenomena of mind exactly like the phenomena of matter, and abstract altogether from consideration that distinctive characteristic of man's being, by virtue of which he is a subject of knowledge and a moral agent? Can we safely accept the data of a purely objective anthropology and biology without subjecting them to reinterpretation in the light of that self-consciousness which is the type of all knowledge? Are those men of science right who say that our knowledge is a mere abbreviation of particulars derived from sense, or is that account of the process by which we arrive at knowledge correct, which declares that we are only capable of rising above sense-perception, because we have implicitly contained in our minds, though elicited by experience, the idea of an intelligible totality of things, and that we find a clue though the maze of particulars in the principle of causality, which is not given by experience? Is man purely the result of natural forces, working upon him from without, or is there in him a principle which in a sense is not natural, but supernatural? Are we to believe that conscience is merely the register of experiences of utility enforced by the machinery of rewards and punishments on the susceptibilities of successive generations of our ancestors to pleasure and pain? Are we to consider the genesis of human morals a mere chapter in the history of animal evolution? The necessity of philosophy rests on the hypothesis that man cannot be simply an object externally determined, or, as Professor Green puts it, that the knowledge of nature cannot itself be a part of nature, and that there is a spiritual element in knowledge which no possible investigation into the laws of matter and motion can explain. At any rate, before accepting any theory, the first step is to appreciate the mystery of human nature, and to analyse it as far as may be, as it exists now, and see what the problem is which is before us for solution. Nowhere has the radical contrast between the spiritual dignity of man, as the subject of knowledge and the natural weakness of man exposed to the cruel tyranny of external forces, been more forcibly stated than in the words of Pascal, "Man is but a reed, the feeblest of created things, but one possessing thought.

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It needs not that the universe should arm itself to crush him. A breath, a drop of water suffices for his destruction. But were the whole universe to rise against him, man is yet greater than the universe, since man knows that he dies. He knows the universe prevails against him. The universe knows nothing of its power." And as the study of philosophy should, at any rate, begin not by the acquisition of the latest results of science and of the philosophical gloss put upon them, but by an appreciation of the problem which has to be solved in the relation of man to the universe, so I think that the first works to be studied should be not elaborate dissertations and treatises, but the writings of those men to whom philosophy has been the bread of life and not merely the polite amusement of leisure hours. There could hardly be a better example of this class of books than the reflections of Marcus Aurelius, to which G. Eliot's well-known description of St. Thomas a Kempis' "Imitation" might well be applied. The book is, indeed, "a chronicle of the soul's endurance, written down by a hand which waited for the heart's prompting." All systems of philosophy worthy of the name seek to give men a workable theory of life. Dorothea, in Middlemarch, asked Lydgate what his religion was, and explained herself to mean by religion the belief he found most helpful to him in life. It is the most interesting fact to know about anyone's history, and that we assuredly find in M. Aurelius. Consider the following passage:—"In short everything which belongs to the body is a stream, and what belongs to the soul is a dream, and vapour, and life is a warfare and a stranger's sojourn, and after fame is oblivion. What then, is that which is able to conduct a man? One thing, and only one—philosophy. But this consists in keeping the dæmon within a man free from violence and unharmed, superior to pains and pleasure, doing nothing without a purpose, not falsely and with hypocrisy, not feeling the need of another man's doing, or not doing anything, and besides, accepting all that happens and all that is allotted as coming from thence wherever it is from whence he himself came, and finally waiting for death with a cheerful mind as being nothing else than a dissolution of the elements of which every living being is compounded. But if there is no harm to the elements themselves in each continually changing into another, why should a man have any apprehension about the change and dissolution of all the elements? For it is according to nature, and nothing is evil which is according to nature." It adds to the interest of these words that they were written down by the Emperor, not in a library for publication, but for his own eye only, in his tent during an arduous campaign. Of course we ought to rid ourselves in the search for truth, so far as possible, of all *idola mentis*, and personal idiosyncrasies, and also never to forget the maxim, "*Amicus Plato sed magis amica veritas*," but I think we do well, and, in fact, are following this rule if we are chary of trusting ourselves implicitly to the guidance of any characteristically English philosopher, such as Locke, who, to speak loosely, refers everything to sensation, and makes that the test of validity, or J. S. Mill, and H.

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Spencer, who, with infinite ingenuity, apply a single key, such as the association of ideas or the doctrine of evolution, to unlock all the treasure-houses which contain the mysteries of the universe.

A student can hardly do wrong if he follows the advice of Tennyson's "Ancient Sage," as to the spirit in which he should first meditate on those subjects with which philosophy is concerned, into whatever fold he may ultimately be driven in the search for truth:—

> If thou wilt hear the Nameless and will dive
> Into the temple-cave of thine own self,
> There, brooding by the central altar, thou
> May'st haply learn the Nameless hath a voice
> By which thou wilt abide, if thou be wise,
> As if thou knewest, though thou canst not know,
> For knowledge is the swallow on the lake
> That sees and stirs the surface-shadow there,
> But never yet hath dipt into the abysm,
> The abysm of all abysms, beneath, within,
> The blue of sky and sea, the green of earth,
> And in the million-millionth of a grain,
> Which cleft and cleft again for evermore,
> And ever vanishing, never vanisheth
> To me, my son, more mystic than myself,
> Or even than the Nameless is to me—
> And when thou sendest thy free soul thro' heaven
> Nor understandest bound nor boundlessness,
> Thou seest the Nameless of a hundred names,
> And if the Nameless should withdraw from all,
> Thy frailty counts most real, all thy world
> Might vanish like thy shadow in the dark.

And again

> Thou canst not prove the Nameless, O my son,
> Nor canst thou prove the world thou movest in,
> Thou canst not prove that thou art body alone,
> Nor canst thou prove that thou art spirit alone,
> Nor canst thou prove that thou art both in one.
> Thou canst not prove that thou art immortal, no,
> Nor yet that thou art mortal, nay, my son,
> Thou canst not prove that I who speak with thee
> Am not myself in converse with thyself,
> For nothing worthy proving can be proven,
> Nor yet disproven. Wherefore thou be wise
> Cleave ever to the sunnier side of doubt,
> And cling to Faith beyond the forms of Faith.

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THE VALUE OF THE POETIC SPIRIT TO THE SCIENTIFIC WORKER.

By Rev. WILLIAM AGAR. (Read before Section "D.")

I DESIRE to show in this Paper the value and importance of the Poetic Spirit in the life and labours of the Scientific Man. By the poetic spirit, I mean that keen perception and vivid realization exhibited by certain minds of the beauty, wonder, and harmony spreading out and running through all things in earth and heaven, as the blood of a man courses through all parts of his body. All poetry is but the methodical or musical expression of this exalted mood of mind. It is according to Wordsworth's well-known words, "the breath and finer spirit of all knowledge." And this accords very closely with Coleridge's definition—"Poetry is the blossom and fragrancy of all human knowledge, human thoughts, passions, emotions, and language." It is the mission of the Poet to stir our sluggish feelings, and to enkindle our feeble imagination, so that we may in a larger measure realise the wealth of beauty at our feet, and the glory beyond glory out-spread over our heads.

It is the work of the Scientist, on the contrary, to investigate, find out, and explain the laws, relations, and properties of matter and mind. He concerns himself only with definite facts, and exact knowledge, and is content to group this acquired information into order, shape, and system. After he has tabulated, arranged, and co-ordinated these laws and properties connected with inorganic and organic Nature, he has done his work. The subtler influences and the spiritual impressions made upon the sensitive mind by the pomp and pageantry of the rolling seasons, the varied voices in nature, the play of passion, the touch of pathos, the inspiration of heroism—all the mystery and mastery, woe and triumph connected with human life—this is outside the circle of his accredited pursuits. The action and reaction of the world of matter upon the world of mind is generally considered the concern only of the poet. It is the special function of the Scientist to inform; of the Poet to arouse and to inspire. The one arranges and classifies our acquired knowledge; the other interprets our feelings; and gives to those abstract influences that come from Nature and the deeper affairs of human life a form and colour, "a local habitation and a name."

It is hardly necessary for me, I suppose, to argue that the class of facts usually dealt with by the Poet is just as real as that ordinarily dealt with by the Scientist. The world is flooded with beauty just as surely as it is governed by law. The delicate grace and pendent beauty of the hare-bell is as much a part of its being as the rounded leaves found at the bottom of its slender stem. The Universe is not made up of a dead

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multitude of facts, with little significance and suggestion but is rich in a fulness of living energy; and is instinct with impressive relations, and vibrates with subtle harmonies. The unknown powers and properties of the world are vastly greater than any that have yet been discovered, and they for ever stimulate the reason and excite the imagination. It is still as true in our as in Shakespere's day:—

> "There is more in heaven and earth
> Than is dreamt of in *our* philosophy."

Have these two classes of minds, these two types of workers, nothing in common? Are they separated by an abyss the one from the other? Must the Scientific thinker, if he would be successful in his labours, let the realm of poetry, its visions, and its soarings, severely alone? Is he helped or hindered in his discoveries, investigations, teachings by the exercise of the imagination? It is my belief that no man can attain any great success as a scientific thinker and worker who is not touched with the poetic spirit. Of course he needs other endowments or acquirements. He must be a careful observer; possess a good judgment, and an intellectual grasp of facts. He will need to be patient in investigation and experiment, candid in statement, modest in his bearing. All these characteristics will greatly help him, but if he is to be fully equipped, he must possess, in addition, the plastic power of the imagination.

This is the great creative agent in the work of the Poet, and it is almost as much required in the highest work performed by the Scientist. The Great Master has said in that well-known passage—

> "The poet's eye, in a fine frenzy rolling,
> Doth glance from heaven to earth, from earth to heaven,
> And, as imagination bodies forth
> The forms of things unknown, the poet's pen
> Turns them to shapes, and gives to airy nothing
> A local habitation and a name."

This power of seeing things invisible to the senses; of bodying forth the forms of things unknown; of following up hints and guesses to probable conclusions, seeing resemblances and connections between distant and dissimilar groups of facts; this shaping, uniting, anticipating, power of the imagination has played a most important part in the early speculations and discoveries of the Scientific mind. As Mercury was the messenger of the gods of Greece so we may describe Imagination as the nimble fleet-footed messenger of the powers of the mind. It traverses the darkened regions of Chaos, to throw lines of light upon the unknown, that slow-footed reason and judgment may follow to establish a solid way for order and harmony.

It has been the pioneer of nearly all great discoveries. When the student has been overwhelmed by a great mass of facts and figures that would not square with any great principle or known law, this mercurial messenger has flashed an image, or found a missing link, and a new world of hope has dawned upon his soul. The Poetic Power has ever been the forerunner of reason and solid attainments.

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In the childhood of the world wonder, awe, and the shaping imagination have reigned supreme. As Professor Müller shows, these spiritual attributes in the presence of the sublime and terrible in Nature have formed all the myths and mythologies to be found in literature. A rosy cloud of poetry hangs its gay folds over the early history of every great nation. And so, too, we find in the first stage of individual growth the same shaping power rules with all but undisputed sway.

Everything is wonderful and strange to the child, and therefore the imagination is roused to boundless activity. Like the young bird, learning to fly, the attempts of the childish imagination are but feeble and spasmodic, and its wings soon tire of their burden. It is sad and fatal policy to discourage these soaring flights. They are the beginnings of one of the noblest powers of the mind. They may seem crude, but they form the raw material from which, together with other mental powers, the splendid genuis of a Goethe, Newton, or Shakespere has been established.

This teeming fancy, this wonderment and awe so active in the child and the childhood of a nation, is not left behind in the development of the individual and the race. When the little world in which it plays a part is better known, and the mysticrealm of poetry becomes defined, the wings of the imagination take higher flights and seek a larger inheritance. However extensive the knowledge, however embracing the sweep of the intellect, the imagination still finds plenty of room to work in, and plenty of work to do. It will still act as the pioneer of fresh discovery; it will still guide the great, yet slow-moving army of thoughts to new conquests in unknown lands.

Let me confirm what I have here advanced of the great service rendered to Scientific research and discovery through the agency of the poetic spirit by examples taken from the lives of master minds in the ranks of Science.

It is manifestly present in the labours of Galileo and Kepler, not to go back too far in the past for illustrations. Galileo, we are informed, was extremely fond of music and poetry, and cultivated assiduously these sister arts. He knew Ariosto almost by heart. Kepler, to whom modern astronomy is so deeply indebted for the great laws that have immortalised his name, "was of imagination all compact." His wild speculating genius could not be restrained in his early years, and led him into excesses. His great thought that harmony and uniformity existed in certain definite proportions in all realms and spheres of the Universe, though it led him astray in some respects, was a fruitful and fertilising idea. And such an idea would hardly occur to the plodding intellect, but was more likely to be the outcome of poetic insight.

It was only in his later years that Kepler forsook his astrological fancies, made good the foundations of his labours, suggested largely in the beginning by his splendid imagination, and afterwards consolidated by his mathematical genius.

And what shall we say of the leviathan mind of Newton? Was he

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not touched by the transfiguring power of poetry? His life so gentle, modest, natural, and marvellous, was a poem in itself. What a fervid activity, what a tropical luxuriance of suggestion and thought, was crowded in the early years of manhood. Brewster, in his sketch of this part of his career, says, "Were we to judge of the qualities of his mind from the early age at which he made his principal discoveries, and from the rapidity of their succession, we should be led to ascribe to him that quickness of penetration, and that exuberance of invention which is more characteristic of poetical than of philosophical genius." If we may not attribute this amazing fertility to a purely poetic inspiration there is little doubt that we have evidence here of the presence of the plastic power of the imagination.

It would seem that in all master minds, the generalising, suggesting creative power of the imagination is wedded to the testing, analysing, consolidating power of sound judgment. Brewster says, "In the economy of her distributions Nature is seldom lavish of her intellectual gifts. The inspired genius which creates, is rarely conferred along with the matured judgment which combines; and yet without the exertion of both the fabric of human wisdom could never have been reared." We may be certain that the famous apple that is said to have given the clue to the discovery of the law of gravitation would have fallen and been forgotten had it not dropped at the feet of a philosopher, but more of an imaginative and poetic man.

In the great luminary of German literature we have a splendid type of the great poet and scientist blended. Had Göethe never composed a play or a poem his name would have been handed down with honour to future generations as a fruitful worker in the land of Science. And we can see in the author of *Faust* the special contribution made by the poetic gift in the up-building of the great structure of Science. Göethe's name is not associated with any carefully elaborated body of knowledge; it is connected with certain brilliant suggestions and splendid theories. He never developed any great scientific system, but threw out from his poetically illuminated mind fruitful ideas and brilliant suggestions. We may liken him to a great revolving beacon light, casting his vivid beams across the seething waves of doubt and darkness to guide the future discoverer into havens of security.

"When he was at Venice, in 1790," we are told by a biographer, that his servant, jestingly, took up the fragment of an animal's skull from the Jewish cemetery, and offered it to him as a Jew's skull. This remark let in light upon a preconceived theory. It was like Newton's apple. Here, again, he rather indicated the truth than developed it, but he laid the foundation of the theory that osseous forms, like vegetable, are all traceable to one and the same type." And in his "Metamorphosis of Plants," published in 1790, he starts and partly developes the theory that the entire plant, including fruit and flowers, is evolved from a leaf, or is a modification or transformation from it. This is a

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fair specimen of the particular contribution and the special part played in the great work of Science by the poetic spirit. We might name more recent workers to confirm its importance in all great discoveries. We have it stated of Faraday, that his imagination was so powerful and penetrating that it arose sometimes to divination, a scientific second sight, and led him to anticipate results afterwards proved to be true.

It is not claimed that the imagination is a trusty guide and an all-sufficing agent in the discovery of new laws and principles, but it is contended that without its telescopic vision, and far-reaching illuminating power, the great conquests of science would have been lean and poor compared to the splendid results recorded to-day.

* * * * * *

Consider the subject from another aspect. Deep feeling and exalted imagination not only act as the stimulator and forerunner in the labours of the discoverer, but they help—especially the latter power—in the successful *teaching* of Science. Any one who has had even a little experience as a teacher, in any department of knowledge, can bear witness to the helpfulness of apt illustration. It assists the memory and rivets the attention; it simplifies abstruse thought, and carries conviction even to the dullest mind. If we test the hearers of a lecture or a lesson a short time after its delivery, we often find, even among adults, that the only fragment that remains fixed in the memory is some vivid image or telling illustration. If we listen to a lecture on any department of Science comparatively new, or read a book upon some novel theory, unless we possess clear brains and great concentration of thought we take little away with us, supposing the author or lecturer exhibited little imaginative power. If this is often experienced by the fairly trained reason, what must be the experience under the same conditions of the undisciplined intellect? In the keen "fight for existence" and the jostling scramble for a living so largely prevailing to-day, the powers of both body and mind become jaded, and sustained thought in any branch of study is made increasingly more difficult. In the Scientific instruction of children a teacher is absolutely helpless and hopeless, wasting his own and his hearers time, if in his equipment the poetic glow and imaginative power be absent. Whoever is endowed with or has acquired this depth of feeling and power of illustration will find his appeals meet with a quick response. We sometimes find teachers of botany treating a class of children to all the hard names they can think of, recounting the number and proportion of stamens, pistils, petals, ovules, the divisions and subdivisions of families and genera, as though they were dealing with mathematical formulæ. I do not say that a certain amount of grinding at dry facts is not necessary in this as in every other science, but it seems to me that this should come after the mind has been trained to observe the grace and character of plant forms. To see a teacher

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speaking to children concerning objects so full of beauty and so arrayed in wonder, without arousing a glow of admiration, seems to me a pitiful picture. The first thing required to give a boy a taste for any science, especially the study of life, is to awaken in him a glow of interest in the ways, looks, and habits of all natural objects, to thrill him through and through with a love for all that is beauteous, strange, and wondrous, wheresoever found. This will help him to master the harder problems connected with every science. It will quicken his observation, strengthen his imagination, give him enjoyment in his labours, and, instead of making him a petty-fogging conceited student, will turn him into a modest and intelligent investigator. It is little less than a crime in my eyes to make dry and dead what is by nature so full of living interest and beauty, or to convert into bare bald prose that which is surcharged with the spirit of Poetry.

Is it for nought that children and childhood are so steeped in poetry, and that this winsome stage in life's pilgrimage precedes the more prosy, practical, and rational development? It is not for the teacher in any department of instruction, much less of Science, to forget this natural order of mental growth, and surely it is folly to transpose it.

One of the most engaging and successful of lecturers on Science—and that, too, on abstruse subjects, was Michael Faraday. His Christmas lectures to children, given at the Royal Institution, are spoken of even now, as models of their kind. And the reason of this popularity of Faraday as a lecturer is easy to discover. The man loved his work and loved his hearers. He had that natural simplicity that was sure to impress the minds of children. And though he was a man of experiment, and spent much of his time in the laboratory of the Institution, he always kept in touch with Nature, her many moods, and her marvellous impressiveness. He did not shrivel up his nature by solitary exclusion and mechanical experiments alone, but cultivated his imagination, and renewed the springs of sympathetic feeling and poetic delight by contact with Nature and free intercourse with children. It does one good to read of this splendid scientific worker, turning occasionally into the nursery or playground, and beating the young ones in their sports and games; or throwing a little phosphorus in water to amuse a girl who had stolen into his sanctuary for a quiet read. Here is the secret of his success as a lecturer. He did not lose the man in his work. And this fact gave impressiveness to his thought, and added illustrative force to his lessons.

And among the present-day writers in Science there are no books, to my mind, so clear, forceful, and helpful as those of Professor Tyndall. And they are delightful and convincing, because they are so full of apt illustrations. Tyndall is evidently a man, possessing sound judgment, with vivid imagination, and these two he has made good use of in his published works.

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And these remarks respecting the power and popularity of writers and lecturers like Faraday and Tyndall, lead on to a few closing words respecting the influence of the poetic spirit, upon the character of the Scientific man, and the joy that he ought to receive in his labours. It seems a strange thing to me to find a man dealing with the most marvellous of the revelations of Science, and never, apparently, marvelling thereat. It seems strange to find a man studying and teaching about the most lovely objects in creation, and seldom or never being touched with their graceful beauty. We are almost tempted to say of this frigid specimen of fossilised mortality, what *Hamlet* says of a class of players, that "some of Nature's journeymen must have made them, and not made them well, they imitate humanity so abominably." I know that habit and custom have a great hold upon men, and often, without their knowing it, gradually change them into little better than machines for doing a certain kind of work. It is a sad confession, occurring in the life of Darwin, where he says of himself, with his usual candour, that he became little better than a great collecting machine. At one time he was a great admirer of music, and enjoyed with rare zeal the reading of Shakespere's plays, but these, with other delights, had left him. In a measure, Darwin's work necessitated, perhaps, this sacrifice. The greater part of his later life was spent in collecting proofs and making experiments in order to establish his great evolutionary theories. The germs of these theories were scattered about in literature, before he began his labours, and he had only to develope and consolidate them. Still it seems to be a sad confession and a serious sacrifice. It may be necessary, sometimes, that a man should sacrifice himself for the sake of some great work, but we must look upon such instances as exceptions. I prefer to regard Faraday as the sounder and healthier type of the scientific worker. We know that he took a great delight in Nature, never tired of looking into the heavens, delighted in storms, loved to be alone and drink in the beauty of the star-lit heavens. Poetry, Humanity, and Science were harmoniously blended in the character and work of this truly great and loveable man.

I know that temperament and natural endowments have an immense influence over a man, but I still think that no one ought to permit himself to glide into a mere animated machine. A Scientific worker should not suffer himself to degenerate into a fossilised humanity. A "Paul Pry" in Science, collecting scraps, tabulating specimens, and nothing more, is a sorry object. A man should never give up the love of Nature and the love of man. The exigencies of a certain study may isolate him for a certain time, but he should ever renew his youth. Like the trees in autumn, seasons may come when the calls of duty necessitate the shedding of the leaves of his poetical inclinations and studies, but he should see to it, that he has a spring-time again.

Increasing knowledge should be accompanied with growing, not decreasing wonder, and the widening of the intellectual vision should go hand-in-hand with a reverence for all that is lovely and noble in life.

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He should go to Nature and study her wondrous works in the spirit of Tennyson's Address to the floweret:—

> "Flower in the crannied wall,
> I pluck you out of the crannies:
> Hold you here, root and all, in my hand,
> Little flower—but if I could understand
> What you are, root and all, and all in all,
> I should know what God and man is."

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WEEDS.

By F. T. Mott, F.R.G.S. (Read before Section "D.")

The plants which we call "weeds" constitute a very heterogeneous group, which has no place in any natural classification. As weeds they had no existence until man appeared upon this earth and began to cultivate the soil. When he found them trespassing upon his clearings and smothering the plants which he had set there, he remorsely pulled them up and threw them away. When he found them there again, as he certainly would do in a few weeks, he once more bundled them out; and when they returned again and again they roused his anger, and flinging them far away he called them "weeds"—rascally nuisances to be exterminated if possible. Nevertheless they were the rightful tenants of the soil; the aborigines who fought for their native lands, and though perpetually defeated, have never ceased to fight from that first coming of the conqueror even until now. We cannot but admire the pluck and courage of these wild tribes, and their reptilian tenacity of life. We can manage to exclude them from our farms by means of ploughs, horse-hoes, and scufflers, but only on the condition of perpetual vigilance. As the Dutchman must keep watch night and day over his dykes, lest the devouring sea should find an entrance, so the cultivator must never cease his war upon the weeds if he means to get a profit out of the land. But with this war of extermination going on for centuries these wild tribes seem as numerous, as vigorous, and as cunning as ever. Probably they will never be got rid of until some drastic "weed-law," such as has been carried out in some American States, becomes universal, laying heavy penalties upon the man who suffers a weed to be seen upon his holding. When it is no longer possible for a weed to be overlooked long enough for it to ripen seed, then indeed we may hope to see the tribe die out in a few generations and become for ever after a mere matter of history; and although as botanists we might deplore the loss to our native Flora, as humanitarians we could only rejoice in the immense advantage to agriculture.

The species of plants which are to be ranked as weeds depend, of course, upon the climate and the soil of the district. Every country in the world has its own weed-flora, and in regions colonised by distant races strange weeds have often been introduced which have proved greater nuisances than all the natives put together. The Canadian Water-weed has cost England many thousands of pounds, and the Thistle, Dock, Dog-daisy, and Burdock threaten the United States with a still more noxious invasion.

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In England the weeds which are most troublesome are nearly all herbaceous plants, with a few low shrubs in some localities, such as *Salix repens* Rest-harrow, Broom, and Gorse. In this central county of Leicester the chief enemies of agriculture are about fifty species on the arable land, and as many more in the pastures and meadows. Nearly all the principal orders of British plants are represented, Composites being rather more numerous than any other group. The most troublesome of all upon the arable land are the Perennials, with creeping rhizomes, especially the Couch-grass, Colt's-foot, and Horsetail. A mere fragment of the rhizome left in the ground retains its life, spreads rapidly, and produces a new crop. Next to these come the Annuals which produce seeds by thousands—too small to be seen or dealt with until they spring up next year and have absorbed a large quantity of nutriment before they can be destroyed. Among these are various species of Veronica, Euphorbia, Polygonum, Chenopodium, Atriplex, Convolvulus, Capsella, Matricaria, Chrysanthemum, Lapsana, Sonchus, Papaver Brassica, Myosotis, Æthusa, Lamium, Fumaria, and some others. The man who has to make his living by growing corn and roots would be thankful if every one of these plants were expunged from the face of the earth. Not one of them has any commercial value in any form; they are simply destructives, and their existence adds largely to his expenses every year.

The greatest objection to stable manure on agricultural land, especially when produced by animals fed on hay, is the number of weeds which it always introduces. The ripe seeds of these plants pass through the animals not only not killed by the digestive processes, but in some cases positively vitalised and made more vigorous. This is avoided if the animals are fed on roots, crushed corn, cake, straw, or second-crop hay. It might be worth consideration whether ordinary hay, cut when the seed is formed, in order to secure the most nutriment, should not be discarded as a food for horses or cattle, the grass being cut at an earlier period, and mixed with some more nutritious substance. It would increase the cost of the food, but should raise the value of the manure by the whole cost of weeding. Artificial manures, and all house manure, are free from this drawback to their value. Sheep fed on the ground on turnips or mangold have also the advantage of producing manure without weeds. The sewage of towns is probably not entirely free from the seeds of weeds, but would be likely to be better in this respect than most stable manure.

The chief injury inflicted by weeds is not, perhaps, so much in absorbing the food of the growing crop as in crowding and overshadowing it. In any crowd of plants the most rampant, which overtop the others, absorb the light, and those below are stunted and often die out in consequence. The food taken from the soil is mostly water and salts. There may be water enough for crop and weeds both, and the small quantity of salts required will be returned to the soil if the weeds are dug in, but without the energy of the light-beam upon the sensitive

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chlorophyl there will be no combination of the carbon of the air with the hydrogen of the water, and the life-sustaining starch will not be formed. This starch, with its analogues sugar, dextrine, inuline, cellulose, &c., is the main element of food to all vegetable and animal organisms. It supplies the carbon for the tissues and the fuel for respiration. It is largely for the production of starch that all agriculture is carried on. It is, therefore, because weeds obstruct the formation of starch by keeping out the light and occupying space that they are chiefly noxious.

The group of plants which have to be treated as enemies in pasture lands and meadows is distinctly different from that which infests the ploughed fields. In some districts several low shrubs are troublesome, such as Dwarf Willows, Rest Harrow, and Gorse. In wet lands the Rushes, Sedges, and Tussock-grass will destroy half the crop. But as these can be got rid of by draining, it is usually the farmer's own fault if he suffers much loss from them. The common Field Thistle, *Carduus arvensis*, and the Spear Thistle, *C. lanceolatus*, are perhaps the worst of all pests in pasture fields. Against these plants especially the power of the law might well be directed. The careless farmer who suffers thistles to disgrace his own land and to scatter their seeds over his neighbour's fence should be severely taught that such things cannot be tolerated in a civilised country. The Field Thistle has the peculiarity of being sub-dicœcius. Some plants produce nearly all male flowers, others nearly all female, and these generally grow together in separate patches. Both forms produce the spreading pappus, and hence many of the tufts of floating thistle-down are to be found without seeds attached to them.

Buttercups and Daisies may be pretty and poetical, but they are great destroyers of grass. The late-flowering Buttercup—*Ranunculus acris*—often occupies, with its acrid leaves and wiry stems, quite a large proportion of the fields in which it flourishes, and the patches of it are left untouched by the cattle even when the grass between them is eaten down to the roots.

The Bulbous-rooted Buttercup—called in some parts St. Anthony's Turnip, because pigs like it, and Anthony is their patron Saint—is the common Buttercup of the early Spring, making the fields golden in the month of May. Its leaves are less acrid than those of *acris*, and are probably eaten in small quantities by cattle as a condiment, but it is generally much too abundant. It is said that both these plants lose their acridity when dry, and become useful food, but they are not likely to be as nutritious as good grass or clover, and must be ranked as weeds even in meadows laid for hay. The Creeping Buttercup—*Ranunculus repens*—has scarcely any acridity, but it is often a rank grower, smothering everything within its reach.

Daisies, though not unwholesome, and probably eaten with the grass among which they grow, are objectionable weeds, because their close rosettes of leaves occupy much space and yield but little herbage.

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Every rosette two inches in diameter occupies three square inches, and half-a-dozen such in every square foot would take up one-eighth of the whole field, or half an acre out of four acres. On dry soils the daisies are often as thick as this, and in such cases it would surely pay to have them rooted out by hand.

All the three species of broad-leaved plantains are mischievous in the same way as daisies, by occupying space which might produce better food. The upright variety of *Plantago lanceolata* has been recommended, indeed, as good fodder, especially for sheep, which are particularly fond of its mucilaginous leaves, but it is found to be less nutritious than ordinary grass, and is not much relished by horses or cattle.

Other weeds which occupy space by their rosettes of leaves are the Cowslip, Dandelion, Cat's-ear, and Lesser Celandine.

Sometimes *Cardamine pratensis*, the Lady's Smock, or Cuckoo Flower, becomes a nuisance by its over-abundance, although innocent and perhaps useful in a smaller proportion. Hard-Heads, *Centaurea nigra*, is bad in every way, almost as bad as thistles. *Luzula campestris*, the little Hairy-rush, though inconspicuous, is often troublesome, occupying large tracts which should grow better things.

Holcus lanatus, the too-abundant grass called Yorkshire Fog, is considered to be quite useless as fodder. It is one of the European weeds which flourish disastrously in the United States. There is a small creeping umbelliferous plant, the Water Penny-Wort, *Hydrocotyle vulgaris*, which is often abundant among the grass in low wet districts, and which farmers dislike greatly from a belief that it causes the rot in sheep. It is true that such pastures are often dangerous, but the danger lies not in the *Hydrocotyle*, but in the small water snails which are left among the grass by floods, and which are the natural hosts of the sheep Fluke in the early stages of its life. These mollusks are eaten by the sheep, and thus the flukes are introduced into their bodies.

But there are one or two really poisonous weeds which make some pastures almost unusable. *Colchicum autumnale* is perhaps the worst of these, and the most dangerous time for cattle in fields where this curious plant is found is the Spring and early Summer, when the seed vessels are above ground, for in the seeds and roots the poison is especially abundant. This plant should either be eradicated or cultivated. There is a large demand for it medicinally, and in some counties many fields are devoted to its culture.

Conium maculatum, the true Spotted Hemlock, is another of these poisonous weeds, often abundant in hedgerows and the corners of fields, useful as medicine, but dangerous both to man and beast, and which ought, therefore, to be eradicated as a weed, and confined to cultivated areas. I have seen persons gathering this for rabbits in mistake for *Anthriscus*, and have warned them of the danger, but whether rabbits are injured by it I do not know. There is a curious parasitic weed common on the Continent, but only seen sporadically in Britain, and

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very rarely in this county, *Cuscuta trifolii*, the Clover Dodder, which is terribly destructive in clover fields. It twines about the stems, sucking the sap out of them, stunting the leaves, and seriously diminishing the crop. There are only two records of its appearance in Leicestershire. In 1850 I found it devastating a clover field on Charnwood Forest, and in 1887 a specimen was brought to me from Sapcote.

The human race has found it necessary to civilization everywhere to exterminate noxious animals. Tigers, wolves, bears, wild cats, and serpents have to disappear where man desires to dwell in peace. This extermination has generally been effected in a very hap-hazard fashion, which has only succeeded because the numbers of such animals are nowhere very large.

The extermination of noxious plants will never be accomplished by such means. They are so numerous, so small, so rapidly propagated, that they can always elude all desultory attacks. One combined effort for five or ten years throughout Great Britain might clear the land of them, and save some millions of pounds a year for ever afterwards. But such an effort can never be made unless it is enforced by Act of Parliament.

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NOTES ON THE GENUS GENTIANA, *Linn.*

By Rev. T. A. Preston, M.A. (Read before Section "D.")

Perhaps there is no Genus of Flowers which strikes the admiration of Alpine tourists so much as that of the Gentians. Flowers generally seem to have more intense colouring in the clear air of the higher regions, but the Gentians seem to surpass them all in brilliancy, whether it be the tiny *nivalis* in the grass of the lower slopes, or the dazzling blue of *bavarica*, *acaulis*, and others, as we proceed up higher to the snow line. And what is more, these colours can be well preserved in most of the specimens, when dried, and many a tourist can recall a delightful expedition by some small fragment of a Gentian well preserved in his note-book or guide-book.

Gentians, of which there are about 180 species known, flourish from near the snow-line, where they are most plentiful (reaching a height of 16,000 feet in the Himalayas), and at all lower altitudes down to sea-level. In the Northern Hemisphere they may be characterised as peculiarly abundant in mountainous districts, and penetrate into the Tropics along the higher ranges of both the Old and New Worlds. But it is especially remarkable that, though plentiful near the *snow limit*, they are yet scarce in the higher *latitudes*. They form a *mountainous*, but not an *Arctic* Genus. They are entirely unknown to the Floras of the Polar and American Islands. Very few inhabit Greenland, Iceland, or the Arctic shores of the Northern Hemisphere. In the Antarctic Islands of the Southern Hemisphere, in Tasmania, New Zealand, and Fuegia, they are very scarce. They are infinitely less numerous in the northern parts of Europe and in America, or Chili and Patagonia, than in the Alps of middle and Southern Europe. This is a very remarkable fact, for the species of plants growing at high *altitudes* occur, as a rule, in high *latitudes*, and are generally considered as relics of the glacial epoch. The species occurring in the elevated and cold regions of the higher mountains are such as compose the mass of Polar vegetation, but to this the Gentians form a remarkable exception.

As regards the distribution of species, the most remarkable is that of *G. prostrata*. It occurs in the Carinthian Alps, in Europe (at a height of from 6,000 to 9,000 feet); in the Altai Mountains, in Asia (at a height of from 15,000 to 16,000 feet); in the Rocky Mountains, in North America; in the Eastern Andes, in South America; and descends to the sea-level at Cape Negro, in the Straits of Magellan, and at the Cape of Good Hope, in Behring Straits.

As regards the colours of Gentians, blue is certainly the prevailing colour; but yellow, white, and red also occur. In Britain, the com-

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monest species are of a very washed-out purple, the three rarer ones being blue. In the Himalayas all are blue. In Europe a very few are yellow, the rest blue. And in America, some are white, others yellow, blue, or even red, though if the "Red" be the same as that given in Curtis' "Botanical Magazine" for *G. incarnata*, it is a very poor red indeed. The red species are nearly all confined to the Andes and New Zealand. Dr. Jameson, in his "Flora of the Andes, Peru, and Columbia," says, "I know sixteen species of Gentians, half of them are red, four purple, two blue, one yellow, and one white." Among the exotic species, *several* are yellow.

The name of the Genus is derived from Gentius, a king of Illyria, who, according to Pliny, first discovered the tonic virtues of the plants of this Genus. Medicinally, the whole Order is interesting, as being universally bitter. Not only is every species very bitter, but every part of the plant (root, leaves, flower, and fruit) is so also. Some few are also narcotic and emetic, but bitterness is the prevailing principle. *Erythræa*, *Blackstonia (Chlora)*, *Limnanthemum (Villarsia)* are all bitter, *Menyanthes* intensely so. According to Withering, this last has been used instead of hops. The Gentians are generally used medicinally; the "Gentian Root," of chemists, is the thick root of *G. lutea*, which grows plentifully in some parts of Switzerland and Germany, covering acres of ground, undisturbed by cattle. It is very bitter, though it seems to be exceeded in bitterness by *G. purpurea* (which is sometimes used for it); the roots of this latter are "as thick as a man's arm and two feet long." In cases of emergency the two common British species, *G. Amarella* and *G. campestris*, can be used instead of *G. lutea*, but of course are not so powerful.

The Swiss make a liqueur from some species, and *G. cruciata* has been superstitiously believed to be a cure for hydrophobia, because its leaves grow in the form of a cross.

Very few Gentians are cultivated in gardens, possibly from the difficulty of getting specimens with uninjured roots. Those which are not annuals have very deep roots or very much divided stems under ground, and the difficulty of getting the plants up without great injury is considerable. They can be increased by division, but it is a doubtful process, or by seed, which is a very slow one. Many species will grow in a rich light soil; some require peat, others must be grown in pots and protected in a cold frame. If raised from seed, it should be sown as soon as ripe; if kept till the following spring, the seed will not germinate till the second year.

The leaves are opposite, with from three to five ribs; in the low growing species, often appearing as rosettes. The Corolla and Calyx are 4-5 cleft or lobed, stamens 4 or 5; ovary 1-celled, placentas parietal, with numerous ovules. Such are the main characteristics of the Order, though there are exceptions to every particular. According to Lindley, *Gentianaceæ* approach very near to *Apocynaceæ*, though the affinity to the few representatives of that Order in England is not very striking.

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One Genus *Voyra*, a parasitical, scaly plant, connects the Order with *Orobanchaceæ;* but the nearest ally seems to be *Scrophulariaceæ*, from which its regular flower and 1-celled ovary easily separate it.

The Corolla, which is more or less tubular, has, in some species, an extra plait or fold between the petals; this plait is often prolonged into a kind of scale between the petals, and is occasionally fringed; the throat of the Corolla is also, in some species, bearded—all these different "extras" forming good means for separating the species. In England we have but five or six species of Gentian, for Switzerland Koch enumerates thirty; whilst for the whole of Europe, Woods enumerates thirty species and four hybrids, and Nyman thirty-seven species and three hybrids. I shall adopt the classification of Woods, as being the simplest and best.

He makes four primary divisions:—

(1.) Tube of Corolla short, or greatly enlarged at the mouth.
(2.) Tube of Corolla cylindrical, or somewhat barrelled.
(3.) Throat of Corolla bearded.
(4.) Tube of Corolla naked, but petals fringed.

Of (4), we have only one species in Europe, the lovely *G. ciliata*. Figures of the allied Siberian *G. barbata*, and the American *G. crinita*, are given in "Curtis." It cannot be confused with any other Gentian.

Of (3), there are two sets, one with the calyx tubular, the other with the calyx deeply divided and the flowers on long naked stalks. Of the former set is *campestris*, with its 4-cleft corolla and its singularly unequal sepals, the two outer covering the two inner, this character alone being sufficient to separate it from all the other species of Gentian. *Amarella* is very similar to *campestris*, but has the corolla 5-cleft and the calyx with five equal teeth. Very similar to it is *germanica*, considered by Hooker and Babington as a sub-species; the principal difference being in the length of the stipe of the capsule, which is very short in *germanica*, but one-third as long as the capsule in *Amarella*. It is a stouter plant than *Amarella*, and has two of the lobes of the calyx larger than the other three, and much shorter than the corolla tube. There is an early flowering variety of *Amarella*, which has a 4-cleft corolla and unequal sepals, so that it is quite possible that the two are but varieties of the same species. The other species of this section, *obtusifolia*, is mainly distinguished by the lower leaves being blunt, whence its name.

Of the other set are *tenella* (or *glacialis*) and *nana*. The former is a very distinct species, with its long flower-stalks; of the latter I know nothing.

We now come to (2), the most difficult to discriminate of all the sections. The first division is into annuals and perennials. Of the annuals there are three European species, *prostrata*, already noticed as having a greater range than almost any other plant; it is known by the plaits of the corolla being expanded and lengthened to more than half the length of the lobes of the corolla. *Utriculosa* has the calyx

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remarkably inflated and a rather large deep blue corolla. The lovely little *nivalis*, often a minute plant, has small bright blue flowers.

Of the perennials, *bavarica* is known by its deeply cloven style (the other species of this division having the style undivided; *pyrenaica*, by having the plaits forming ten divisions; *imbricata*, by having all the leaves imbricate; and *pumila*, by its linear leaves. The three remaining species have the leaves in rosettes; *verna* has the calyx winged, and *brachyphylla* not so; the third, *æstiva*, is probably only a variety of *verna*, though its flowers are twice as long as in that species.

Of (1), there are two main divisions; those which have the flowers in whorls or heads, and those which have them solitary, or in pairs. It may be said to contain all the tall growing species, as well as some of the low growing ones. Of those with whorled flowers *lutea* has a rotate corolla, without plaits, but with long narrow divisions, and is yellow. The other species in this set are considered to be hybrids, *Thomasii*, with its purple, somewhat spotted flowers, a cross between *purpurea* and *lutea; Charpentieri*, with its 5-cleft corolla and yellow flowers, a cross between *punctata* and *lutea; biloba*, with its 6-cleft corolla, of which I know nothing; and lastly *Gaudini*, with its anthers united, a cross between *punctata* and *purpurea*. Of the species with plaits, *purpurea* has its anthers closely united and its corolla purple externally; *Burseri* and *macrophylla* have their anthers separate, the former with a yellow corolla with dark spots, the latter with a fine blue corolla. The calyx of these three is in the form of a sheath deeply divided on one side; three others have a campanulate calyx; *pannonica*, with a spotted purple corolla, divided into six or seven divisions; *punctata*, with its pale yellow corolla in six divisions; and *cruciata*, with its 4-cleft pure blue corolla.

Of those with their flowers solitary or in pairs, three have the anthers separate, *frigida*, with its corolla whitish with blue stripes; *asclepiadea*, with its corolla blue internally, with dark dots, the only Gentian growing in thickets; and *pneumonanthe*, with its corolla deep blue within, with five green dotted stripes, an inhabitant of peaty meadows.

Lastly, three species of this set have their anthers united. *Froelichii*, with its pale blue unspotted flowers, an inhabitant of very high mountains in Carniola; *acaulis*, the most generally cultivated of the Gentians, commonly called *Gentianella;* and *excisa*, only to be distinguished from *acaulis* by the teeth of the calyx; this species having them narrowed at the base, whilst *acaulis* has them tapering.

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A LIST OF THE MACRO-LEPIDOPTERA OF LEICESTERSHIRE.

By F. Bouskell and C. B. Headly. (Read before Section "E.")

It is now nearly two years since it was suggested to us by the President of the Society, Mr. F. T. Mott, that it would be desirable to compile a list of the county Macro-Lepidoptera.

We undertook the task with some hesitation, expecting to collect about 200 notes, but through the kindness of our county Lepidopterists, we are glad to lay before you a list of upwards of 448 distinct species. We have given the place, date, and name of the person, recording each of the rarer species whenever it has been possible to do so. The Leicester, Loughborough, Harborough, Ashby, and Charnwood Forest districts have all been thoroughly worked, but there is still a large portion of the county at present unworked, and until that is done it will be impossible to compile a complete list.

It will be seen that out of the 66 British Diurni or Butterflies we have 37 recorded for the county, but we are afraid that several recorded do not occur at the present time.

Out of the 102 Nocturni we have 60, the most remarkable record being that exceedingly rare insect Chaerocampa Celerio, which has only occurred several times in England.

Out of the 277 Geometræ we have 150.

Out of the 32 Cuspidates we have 17, and out of the 311 Noctuas we have 184.

So that, out of a total of 788 Macro-Lepidoptera occurring in the British Isles, we have 448 which have been found in our county.

We hope that the list may prove useful to those interested in the range and distribution of Lepidoptera, and also to those who may wish to collect in the county.

We thought of bringing out a supplementary list in the course of a few years, and we shall be glad to receive any notes.

In conclusion, we wish to thank the following gentlemen heartily for their notes and valuable assistance, viz.: Rev. A. Matthews, M.A., of Gumley; Mr. J. Wieldt, of Loughborough; Rev. G. A. Smallwood, late of Ashby-de-la-Zouch: Mr. Montagu Browne, F.Z.S., F.G.S., Mr. Mott, and Mr. F. R. Rowley. If it had not been for their help we are quite sure the list could never have been produced.

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DIURNI.

LEUCOPHASIA. *Sinapis.*—Earl Shilton, August, 1880.

PIERIS. *Brassicæ.*—Common May to August.
Rapæ.—Common April to August.
Napi.—Common May and August.

ANTHOCHARIS. *Cardamines.*—Fairly common in May.

GONEPTERYX. *Rhamni.*—Not uncommon; has occurred at Ansty, Aylestone Road, Birstall, Evington, Gumley, Humberstone, Loughborough, Billesdon, Scraptoft, Sixhills, Tilton, Wanlip, Wigston in July and August.

COLIAS. *Edusa.*—Humberstone Road, September 19, 1875; Ratcliffe, June 17, 1877; Ansty Lane, Bradgate, August 5, 1877 (W. H. Scott); Beaumont Leys and Wanlip, September, 1877; Birstall and Evington, September, 1877; Syston, May 5, 1878 (F. R. Rowley); Knighton, June, 1885 (F. Bouskell); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt).
Var Helice.—Ansty Lane, September 9, 1877 (W. H. Scott); Abbey Park (F. R. Rowley).

ARGYNNIS. *Paphia.*—Billesdon, July 28, 1880; Skeffington, August 1, 1881; Owston, August 4, 1881 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Euphrosyne.—Knighton, June, 1885 (F. Bouskell); Bradgate, June, 1886 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.
Selene.—Near Loughborough (J. Wieldt); occurs May and June.

MELITIÆ. *Artemis.*—Near Market Harborough (Rev. A. Matthews); occurs in May.

VANESSA. *C. Album.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs August to October.
Urticæ.—Common everywhere February to September.
Polychloros.—Fairly common; has occurred at Anstey Lane, Billesdon, Quorn, Mountsorrel, Swithland, Loughborough, Ulverscroft, Bradgate, Newtown Linford, Scraptoft, Evington, Owston, Ingarsby, in July, August, and September, also May and June.
Antiopa.—Near Loughborough (J. Wieldt); Railway Embankment, Leicester (J. R. Weatherhead); Bitteswell (W. T. P. Winter); Gumley (Rev. A. Matthews); all many years ago; Leicester, 1873 (F. Bates); Leicester, 1873 (T. Walker).
Io.—Common in August and September.
Atalanta.—Common August to October.
Cardui.—Common August and September.

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APATURA. *Iris*—Mentioned by Stainton as occurring in Leicestershire, but we have no other note.

ARGE. *Galathea.*—Gumley (Rev. A. Matthews); occurs in July.

SATYRUS. *Ægeria.*—Near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs April and July.

Megæra.—Fairly common; has been taken at Mountsorrel, Seagrave, Loughborough, Scraptoft, Whitwell, Sixhills, Billesdon, Tilton, Ratcliffe, Gumley; occurs August.

Janira.—Common in July.

Tithonus.—Common in July.

Hyperanthus.—Bardon Hill, Scraptoft, Skeffington, Owston, Sixhills, Billesdon, Barkby (F. R. Rowley); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt); occurs July.

CHORTOBIUS. *Pamphilius.*—Common May to October.

THECLA. *Quercus.*—Quorn, July 4, 1873; Ulverscroft, August 3, 1874; Buddon Wood, July 25, 1875; Swithland, July 27, 1877; Ansty Lane, July 17, 1879 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July and August.

W. Album.—Mountsorrel, July 21, 1873-4-5; Buddon, July, 1875; Rothley, August, 1871 (common); Swithland, July 27, 1877 (F. R. Rowley); Owston (W. H. Scott); Loughborough (J. Wieldt).

Pruni.—Owston, August 4, 1881 (W. H. Scott); Gumley (Rev. A. Matthews).

POLYOMMATUS. *Phlæas.*—Common June to October.

LYCAENA. *Agestis.*—Gumley (Rev. A. Matthews); occurs July.

Alexis.—Common May to October.

Argiolus.—Gumley (Rev. A. Matthews); occurs May to August.

SYRICHTHUS. *Alveolus.*—Sixhills, June 1, 1882; June 12, 1884 (F. R. Rowley); Gumley (Rev. A. Matthews).

THANAOS. *Tages.*—Near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs May.

HESPERIA. *Sylvanus.*—Sixhills, 1882-3-4; Ratcliffe, June, 1883-4; Ashby Flamville, and Barkby, June, 1884 (F. R. Rowley; Gumley (Rev. A. Matthews); near Loughborough (J. Wieldt).

Linea.—Loughborough (J. Wieldt); near Harborough (Rev. A. Matthews); occurs July.

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NOCTURNI.

SMERINTHUS. *Ocellatus.*—Leicester, Bradgate, Croft (F. R. Rowley and C. B. Headly), common; near Loughborough (J. Wieldt); Gumley, Queniborough, and Aylestone; occurs July and August.

Populi.—Very common at Aylestone, Knighton, Quorn, Gumley, &c., in July and August.

Tiliæ.—Loughborough, July, 1890, and larvæ (J. Wieldt); Earl Shilton, June, 1880; also (W. A. Vice); Gumley (Rev. A. Matthews).

ACHERONTIA. *Atropos.*—Leicester, August 20, 1881, larvæ; Railway Cutting, near Leicester, June 27, 1885-6 (F. R. Rowley); Mountsorrel, in beehive (G. H. Storer); Knighton (G. H. Storer); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); Aylestone, October 10 and November 1 (M. Brown); Melton, August 16, 1881.

SPHINX. *Convolvuli.*—Stoneygate, August 29, 1883; Sparkenhoe Street and several other notes for 1885; Thurmaston, August 26, 1887 (J. Barrow); Aylestone, August 30, 1887; New Walk, September 2, 1887; Welford Road (F. R. Rowley); Leicester Cemetery, August 13, 1889 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Ligustri.—Earl Shilton, July 10, 1880; Fosse Road (G. H. Storer); Loughborough, larvæ (J. Wieldt, also F. R. Rowley); Gumley (Rev. A. Matthews); Kibworth, larvæ (Mrs. Macaulay).

DEILEPHILA. *Galii.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs August and September.

CHŒROCAMPA. *Celerio.*—Guilford Street, Leicester, September 27, 1885 (F. R. Rowley).

Porcellus.—Blackbrook, 1874 or 1875 (W. A. Vice); Gumley, not uncommon (Rev. A. Matthews); occurs June.

Elpenor.—Leicester, July 14, 1887 (F. R. Rowley); Loseby, October 15, 1887 (M. Browne); Syston (garden) larvæ; Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

MACROGLOSSA. *Stellatarum.*—Fairly common; has occurred at Buddon Wood, Quorn, Loughborough, Gumley, Leicester, Museum Square, and Fosse Road, Kibworth; June to August; common at Gumley.

Fuciformis.—Gumley (Rev. A. Matthews); occurs May.

Bombyliformis.—Earl Shilton, June, 1880.

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SESIA. *Formicæformis.*—Loughborough (J. Wieldt).
Cynipiformis.—Bradgate Park, August 7, 1889 (C. B. Headly).
Tipuliformis.—Kibworth, July, 1887 (M. Browne); Leicester, July 7, 1888 (F. R. Rowley); Quorn, July 23, 1888 (S. Harris); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Bombeciformis.—Loughborough, July 1888-9; osier beds (J. Wieldt); Leicester, osier beds near Castle (W. Skeffington).
Apiformis.—Gumley (Rev. A. Matthews); occurs July.

ZEUZERA. *Æsculi.*—Not uncommon in July; occurs at Evington, Knighton, Quorn, Woodhouse Eaves, Loughborough, Gumley, Stoneygate, and Welford Road.

COSSUS. *Ligniperda.*—Larvæ generally common.

HEPIALUS. *Hectus.*—Bradgate Park, July 6, 1885 (F. R. Rowley); Ashby-de-la-Zouch, Lount Wood (Rev. G. A. Smallwood); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt).
Lupulinus.—Common in June.
Sylvinus.—Common in July.
Veleda.—Knighton, July, 1889 (F. Bouskell); Quorn (S. Harris); Market Harborough (Rev. A. Matthews); Bradgate Park, July, 1885 (F. R Rowley); Loughborough (J. Wieldt).
Humuli.—Very common June and July.

PROCRIS. *Statices.*—Gumley (Rev. A. Matthews); occurs July and August.

ZYGÆNA. *Filipendulæ.*—Loughborough (J. Wieldt); Gumley (Rev. A Matthews); Aylestone, near St. Mary's Mills; common some years ago (F. R. Rowley); occurs July.

NOLA. *Cucullatella.*—Gumley (Rev. A. Matthews); occurs July.
Strigula.—Gumley (Rev. A. Matthews); occurs July.

NUDARIA. *Mundana.*—Stoneygate, July, 1890 (F. Bouskell); Quorn, July, 1888 (S. Harris); Gumley (Rev. A. Matthews).

CALLIGENIA *Miniata.*—Gumley (Rev. A. Matthews); occurs July.

LITHOSIA. *Mesomella.*—Gumley (Rev. A. Matthews); occurs June and July.
Complanula.—Knighton, July, 1887 (F. Bouskell); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Griseola.—Loughborough (J. Wieldt); Market Harborough (Rev. A. Matthews); occurs July and August.
Stramineola.—Knighton, July 18, 1886 (F. Bouskell); near Harborough (Rev. A. Matthews).
Quadra.—Saddington (Rev. A. Matthews)

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EUCHELIA. *Jacobea.*—Common July.

EUTHEMONIA. *Russula.*—Gumley (Rev. A. Matthews); occurs June.

CHELONIA. *Caia.*—Common July.

ARCTIA. *Lubricipeda.*—Common July and August.
Menthrasti.—Common June.
Urticæ.—Knighton, June, 1888 (F. Bouskell).

LIPARIS. *Chrysorrhea.*—Common July.
Auriflua.—Very common July.
Salicis.—Stoneygate, August 13, 1888 (F. Bouskell); Loughborough (J. Wieldt); Ansty Lane (G. H. Storer); Gumley (Rev. A. Matthews).
Dispar.—Earl Shilton, many years ago; occurs July.

ORGYIA. *Pudibunda.*—Market Harborough (Rev. A. Matthews); Evington (G. H. Storer); Loughborough, larvæ (J. Wieldt); occurs May.
Fascelina.—Market Harborough (Rev. A. Matthews); occurs July.
Gonostigma.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.
Antiqua.—Common at Knighton, Loughborough, Stoughton, Braunstone, and Harborough; occurs July.

DEMAS. *Coryli.*—Market Harborough (Rev. A. Matthews); occurs June.

TRICHIURA. *Crataegi.*—Loughborough (J. Wieldt); Knighton, September, 1890 (F. Bouskell); Stoneygate, September, 1889 (C. B. Headly); Market Harborough (Rev. A. Matthews; larvæ, Ashby-de la-Zouch; common (Rev. G A. Smallwood).

POECILOCAMPA. *Populi.*—Common November and December.

ERIOGASTER. *Lanestris.*—Common; larvæ at Aylestone, Loughborough, Quorn, Harborough, Knighton, &c.; occurs February and March.

BOMBYX. *Neustria.*—Quorn, July, 1889, bred (S. Harris); Loughborough, larvæ (J. Wieldt); Market Harborough (Rev. A. Matthews).
Castrensis.—Quorn, bred (S. Harris); occurs August.
Quercus.—Braunstone (G. H. Storer); Loughborough, larvæ (J. Wieldt); Forest Rock, 1886 (F. R. Rowley); Gumley (Rev. A. Matthews); occurs May and June

ODONESTIS. *Potatoria.*—Common July.

LASIOCAMPA. *Quercifolia.*—Earl Shilton, 1880; Freeman's Common (F. R. Rowley); occurs June.

SATURNIA. *Carpini.*—Gumley (Rev. A. Matthews); occurs April.

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GEOMETRÆ.

URAPTERYX. *Sambucata.*—Common June and July.

EPIONE. *Vespertaria.*—Earl Shilton, June, 1880; Quorn, August 10, 1888 (S. Harris).

Apicaria.—Leicester Freeman's Common (W. Skeffington); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); Stoneygate, July, 1890 (C. B. Headly).

RUMIA. *Crategata.*—Common June, July, August, and September.

VENILIA. *Maculata.*—Common at Bradgate, Swithland, &c., in June, but very local.

ANGERONIA. *Prunaria* and larvæ, near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June to July.

METEROCAMPA.—*Margaritata.*—Common July.

EURYMENE. *Dolobraria.*—Gumley (Rev. A. Matthews); occurs June.

PERICALLIA. *Syringaria.*—Knighton, June, 1886 (F. Bouskell); Quorn, July, 1887 (S. Harris); Stoneygate, July, 1887-8-9 (C. B. Headly); Freeman's Common (F. R. Rowley); Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews).

SELENIA. *Illunaria.*—Ansty Lane, July 31, 1885 (F. R. Rowley); Stoneygate, July, 1887-8-9-90 (F. Bouskell); Quorn (S. Harris); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Lunaria.—Oadby Road, May, 1889 (C. B. Headly); Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews); Staunton Harrold (Rev. G. A. Smallwood).

Illustraria.—Larvæ, Loughborough (J. Wieldt); occurs May and August.

ODONOPTERA. *Bidentata.*—Common May and June.

CROCALLIS. *Elinguaria.*—Common July, August, and September.

ENNEMOS. *Tillaria.*—Common September and October.

Alniaria.—Loughborough (J. Wieldt); occurs September.

Fuscantaria.—August, 1889, September, 1890; Stoneygate (F. Bouskell and C. B. Headly); Gumley (Rev. A. Matthews).

Erosaria.—August, 1889, September, 1890; Stoneygate (C. B. Headly).

Angularia.—Quorn, August, 1889 (S. Harris); Stoneygate, August, 1889, and September, 1890 (F. Bouskell and C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); Bardon Hill (Rev. G. A. Smallwood).

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HIMERA. *Pennaria.*—Loughborough and larvæ (J. Wieldt); September 22 and 25, 1890, Stoneygate (C. B. Headly); September, 1890, New Walk, Leicester (F. Bouskell); Gumley (Rev. A. Matthews).

PHIGALIA. *Pilosaria.*—Stoneygate, February and March, 1889-90-91 (F. Bouskell and C. B. Headly); Gumley (Rev. A. Matthews); Ashby-de-la-Zouch, larvæ (Rev. G. A. Smallwood).

NYSSIA. *Hispidaria.*—Near Loughborough (J. Wieldt).

BISTON. *Hirtaria.*—Gumley (Rev. A. Matthews); occurs April.

AMPHYDASIS. *Prodromaria.*—Quorn, March, 1888 (S. Harris); Stoneygate, March 14, 1888-91 (C. B. Headly); Gumley (Rev. A. Matthews).

Betularia.—Leicester (bred F. R. Rowley), May 23, 1885; Knighton, May, 1886 (F. Bouskell); bred 1890 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Var Doubledayaria.—Stoneygate (C. B. Headly).

HEMEROPHILA. *Abruptaria.*—Stoneygate and Stoughton Lane, May 10 and 14, 1889-90 (F. Bouskell and C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

CLEORA. *Glabraria.*—Gumley (Rev. A. Matthews); occurs July.

Lichenaria.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.

BOARMIA. *Repandata.*—Common June and July.

Rhomboidaria.—Gumley (Rev. A. Matthews); occurs June.

Roboraria.—Gumley (Rev. A. Matthews); occurs June.

Consortaria.—Gumley (Rev. A. Matthews); occurs June.

TEPHROSIA. *Consonaria.*—Gumley (Rev. A. Matthews); occurs June.

Crepuscularia.—Bardon Hill, May 18, 1889-90 (C. B. Headly).

Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Biundularia.—Bardon Hill, May 18, 1890 (C. B. Headly).

Punctulata.—Swithland Wood, May 16, 1889 (F. Bouskell); Loughborough (J. Wieldt); Bardon Hill, May, 1890 (C. B. Headly).

PSEUDOPTERPNA. *Cytisaria.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.

GEOMETRA. *Papilionaria.*—Swithland Wood, 1885 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July and August.

IODIS. *Lactearia.*—Knighton, July 11, 1889; Swithland, Ansty, and Bradgate, June 22, 1890 (F. Bouskell); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

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PHORODESMA. *Bajularia.*—Knighton, July, 1886 (F. Bouskell); Gumley (Rev. A. Matthews).

HEMITHEA. *Thymaria.*—Ansty Lane, July, 1885 (F. R. Rowley); Swithland, July, 1888-9 (F. Bouskell); Knighton, July, 1889 (F. Bouskell); Loughborough (J. Wieldt); Bradgate (C. B Headly); Gumley (Rev. A. Matthews).

EPHERYA. *Punctaria.*—Bradgate Park, July 16, 1885 (F. R. Rowley); Loughborough (J. Wieldt).

Trilinearia.—Gumley (Rev. A. Matthews); occurs May and September.

Omicronaria.—Gumley (Rev. A. Matthews); occurs May and August.

ASTHENA. *Luteata.*—Knighton, June 11, 1887 (F. Bouskell); Swithland, June 21, 1887 (F. Bouskell); June, 1890 (S. Harris); Stoneygate, June, 1890 (F. Bouskell).

Candidata.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs May and June

Sylvata.—Gumley (Rev. A. Matthews); occurs June.

EUPISTERA. *Heparata.*—Quorn, June, 1890 (S. Harris); Loughborough (J. Wieldt).

ACIDALIA. *Scutulata.*—Gumley (Rev. A. Matthews); occurs June.

Bisetata.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.

Trigeminata.—Ansty Lane, July 31, 1885 (F. R. Rowley).

Immutata.—Gumley (Rev. A. Matthews); occurs June.

Remutata.—Loughborough (J. Wieldt); occurs May.

Imitaria.—Gumley (Rev. A. Matthews); occurs August.

Aversata.—Common July and August.

Var Remutata.—Common July and August.

Emarginata.—Quorn, 1888 (S. Harris); occurs July.

TIMANDRA. *Amataria.*—Knighton, June, 1887; very plentiful; June, 1889; one specimen; (F. Bouskell); Stoughton Lane, June, 1890 (F. Bouskell and C. B. Headly); Bradgate, July 7, 1885 (F. R. Rowley); Loughborough and Gumley.

CABERA. *Pusaria.*—Loughborough (J. Wieldt); occurs June.

Exanthemaria.—Blaby, July 12, 1885 (W. A. Vice); Swithland, July, 1887 (C. B. Headly and F. Bouskell); Loughborough (J. Wieldt).

CORYCIA. *Temerata.*—Gumley (Rev. A. Matthews); occurs May.

HALIA. *Wavaria.*—Common July, August, and September.

PANAGRA. *Petraria.*—Bradgate Park, 1885 (G. H. Storer); Swithland, May 16, 1889 (C. B. Headly and F. Bouskell); Loughborough (J. Wieldt).

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FIDONIA. *Atomaria.*—Whitwick, June, 1887 (C. B. Headly); Loughborough (J. Wieldt).
Pinaria.—Bradgate Park, July 9, 1885 (F. R. Rowley).

ASPILATES. *Citaria*—Gumley (Rev. A. Matthews); occurs May and August.

ABRAXAS. *Grossulariata.*—Common July and August.
Ulamata.—Fairly common in July at Bradgate, Quorn, Swithland, Loughborough, Knighton, Gumley, &c.

LIGDIA. *Adustata.*—Loughborough (J. Wieldt); occurs June and July.

LOMASPILIS. *Marginata.*—Swithland, May, 1889 (F. Bouskell); Quorn (S. Harris).

HYBERNIA. *Rupicapraria.*—Common January and February.
Leucophearia.—Stoneygate, February, 1890 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Aurantiaria.—Gumley (Rev A. Matthews); occurs October and November.
Progemmaria.—Common January, February, and March.
Defoliaria.—Common October and November.

ANISOPTERYX. *Æscularia.*—Common March and April.

CHEIMATOBIA.—*Brumata.*—Common October, November, and December.

OPORABIA. *Diluata.*—Common September, October, and November.
Filigrammaria.—Stoneygate, September, 1889 (C. B. Headly).

LARENTIA. *Didymata.*—Common June and July.
Cæsiata—Gumley (Rev. A. Matthews); occurs July and August.
Olivata.—Loughborough (J. Wieldt); Knighton, June 26, 1890 (F. Bouskell).
Pectinitaria.—Swithland Wood, June, 1889; Knighton, June 26 (F. Bouskell); Bradgate Park, July 9, 1885 (F. R. Rowley).

EMMELESIA. *Affinitata.*—Knighton, June, 1888-9; Stoneygate, June, 1889 (F. Bouskell); Loughborough (J. Wieldt).
Albulata.—Loughborough (J. Wieldt); occurs June.
Decolorata.—Knighton, June 2, 1890 (F. Bouskell); Bradgate (C. B. Headly); Gumley (Rev. A. Matthews).
Blandiata.—Gumley (Rev. A. Matthews); occurs May to August.

EUPITHECIA. *Venosata.*—Near Loughborough (J. Wieldt); occurs May and June.
Linariata.—Quorn, June, 1889 (S. Harris); Loughborough (J. Wieldt); Knighton (F. Bouskell).
Centauriata.—Ashby-de-la-Zouch (Rev. G. A. Smallwood); Gumley (Rev. A. Matthews); occurs May and August.

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Subfulvata.—Stoneygate, August, 1890 (F. Bouskell); Leicester, August 11, 1885 (F. R. Rowley); Gumley (Rev. A. Matthews); Willesley Park (Rev. G. A. Smallwood).

Satyrata. — Knighton and Stoneygate, June, 1889-90 (F. Bouskell).

Castigata.—Common May.

Trisignaria.—Cloud Wood, Tonge; abundant; (Rev. G. A. Smallwood); occurs June and July.

Vulgata.—Common May and June.

Absinthiata.—Cloud Wood, Tonge (Rev. G. A. Smallwood); June and July.

Minutata.—Cloud Wood, Tonge (Rev. G. A. Smallwood); occurs June.

Assimilata.—Stoneygate; May and August, 1890 (C. B. Headly); Gumley (Rev. A. Matthews).

Abbrieviata.—Gumley (Rev. A. Matthews); occurs March and April.

Exignata.—Knighton, July, 1889 (F. Bouskell); Gumley (Rev. A. Matthews).

Sobrinata.—Gumley (Rev. A. Mattthews); occurs July.

Togata.—Loughborough (J. Wieldt); occurs June.

Rectangulata.—Stoneygate, July, 1888 (C. B. Headly); Knighton, July, 1889 (F. Bouskell); Aylestone and Blaby (F. R. Rowley); Loughborough (J. Wieldt).

LOBOPHORA. *Sexalata.*—Near Market Harborough (Rev. A. Matthews); occurs May and June.

Hexapterata.—Loughborough (J. Wieldt); Bardon Hill (Rev. G. A. Smallwood); Gumley (Rev. A. Matthews); occurs June.

Viriata.—Gumley (Rev. A. Matthews); occurs May and June.

HYPSIPETES. *Impluviata.*—Swithland Wood, June, 1889 (F. Bouskell); near Market Harborough (Rev. A. Matthews).

Elutata.—Common July and August.

MELANTHIA. *Rubignata.*—Bradgate, August, 1889; Stoneygate, August 24, 1888 (C. B. Headly); Knighton, August, 1889 (F. Bouskell); Loughborough (J. Wieldt).

Ocellata.—Bradgate, July, 1885 (F. R. Rowley); Knighton, July, 1889 (F. Bouskell); Loughborough (J. Wieldt); near Harborough (Rev. A. Matthews).

Albicillata.—Bradgate, July 10, 1885 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

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MELANIPPE. *Procellata.*—Quorn, July, 1889 (S. Harris).
Unangulata.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.
Rivata.—Bardon Hill; common July.
Sociata.—Common May and July.
Montanata.—Common May and June.
Galiata.—Stoneygate, August 25, 1889 (C. B. Headly).
Fluctuata.—Very common May to September.

ANTICLEA. *Rubidata.*—Stoneygate, June, 1890 (C. B. Headly); Knighton, June, 1890 (F. Bouskell); Gumley (Rev. A. Matthews).
Badiata.—Knighton and Stoneygate, April 8 and 9, 1889 (C. B. Headly and F. Bouskell); Gumley (Rev. A. Matthews).
Derivata.—Blaby, May 16, 1889; Stoneygate, May 10, 1889 (F. Bouskell); May 16, 1889 and 1890 (C. B. Headly).

COREMIA. *Propuguata.*—Knighton, July, 1888 (F. Bouskell); Loughborough (J. Wieldt).
Ferrugata.—Common May and August.
Quadrifasaciria.—Common June.

CAMPTOGRAMMA. *Bilineata.*—Common June and July.
Fluviata.—Gumley (Rev. A. Matthews); occurs June and July.

PHIBALAPTERYX. *Lignata.*—Loughborough (J. Wieldt); Knighton, June, 1890 (F. Bouskell); Aylestone, June, 1890 (S. Harris).
Vitalbata.—Stoneygate, June 26, 1890 (F. Bouskell).

SCOTOSIA. *Dubitata.*—Common July and August.
Certata.—Loughborough (J. Wieldt); occurs May and June,
Undulata.—Gumley (Rev. A. Matthews); occurs June.

CIDARIA. *Psittacata.*—Gumley (Rev. A. Matthews); occurs October and November.
Miata.—Stoneygate, October 31 and November, 1889 (C. B. Headly and F. Bouskell); Bradgate, Quorn (S. Harris); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Picata.—Gumley (Rev. A. Matthews); occurs June.
Corylata.—Near Loughborough (J. Wieldt); occurs June.
Russata.—Bradgate, August, 1888 (C. B. Headly); Quorn (S. Harris); Loughborough (J. Wieldt).
Immanata.—Common June and July.
Silaceata.—Bradgate, June 13, 1888 (C. B. Headly); Knighton, April 17, 1889; Stoneygate, 1890 (F. Bouskell); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Prunata.—Common June and July.

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Testata.—Whitwick, August 16 and 21, 1884; Charnwood Heath, August 15, 1884 (F. R. Rowley); Stoneygate, August, 1888 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Populata.—Quorn, July, 1889 (S Harris); Knighton (F. Bouskell); Gumley (Rev. A. Matthews).

Fulvata.—Common July.

Pyraliata.—Common July.

Dotata.—Common June.

PELURGA. *Comitata.*—Stoneygate, August 12, 1890 (F. Bouskell); Freeman's Common, July 18, 1887 (F. R. Rowley); Whitwick, August 1, 1884.

EUBOLIA. *Cervinaria.*—Stoneygate, August 13, 1888, and September 29, 1890 (F. Bouskell).

Mensuraria.—Common June and July.

ANAITIS. *Plyiata.*—Stoneygate, September 3, 1890 (F. Bouskell); Cloud Wood, Tonge (Rev. G. A. Smallwood).

CHESIAS. *Spartiata.*—Loughborough (J. Wieldt); occurs September.

TANAGRA. *Chærophyllata.*—Common at Bradgate and Quorn in June, but extremely local.

CUSPIDATES.

PLATYPTERYX. *Falcula.*—Cloud Wood, Tonge (Rev. G. A. Smallwood); occurs May and August.

Lacertula.—Bardon Hill (Rev. G. A. Smallwood); occurs June and September.

Hamula.—Loughborough (J Wieldt); occurs May and August.

CILIX. *Spinula.*—Common May and August.

DICRANURA. *Furcula.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); Cloud Wood, Tonge (Rev. G. A. Smallwood); occurs June.

Bifida.—Loughborough (J. Wieldt); Cloud Wood, Tonge, (Rev. G. A. Smallwood); Gumley (Rev. A. Matthews); occurs June.

Vinula.—Fairly common May and June.

PETASIA. *Cassinea.*—Gumley (Rev. A. Matthews); occurs October.

PYGÆRA. *Bucephala.*—Common June and July.

PTILODONTIS. *Palpina.*—Stoneygate, July, 1889 (F. Bouskell); Quorn (S. Harris); Loughborough and larvæ (J. Wieldt); Market Harborough (Rev. A. Matthews).

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NOTODONTA. *Camelna.*—Fairly common May to July.
Cvcullina.—Stoneygate, June 26, 1889 (F. Bouskell).
Dictea.—Larvæ, Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs May and June.
Dromedarius.—Loughborough (J. Wieldt); Bardon Hill and Cloud Wood, Tonge (Rev. G. A. Smallwood); Gumley (Rev. A. Matthews); occurs June.
Ziczac.—Bardon Wood, 1885 (F. R. Rowley); Loughborough (J. Wieldt); occurs May.
Chaonia.—Loughborough, larvæ (J. Wieldt); occurs May.

DILOBA. *Cæruleocephala.*—Very common September and October.

NOCTUÆ.

THYATIRA. *Derasa.*—Loughborough (J. Wieldt), also larvæ; Gumley (Rev. A. Matthews); occurs July.
Batis.—Loughborough (J. Wieldt); Hastings Street, Leicester, July 5, 1884; Bradgate, 1885 (F. R. Rowley); near Market Harborough (Rev. A. Matthews).

CYMATAPHORA. *Duplaris.*—Quorn, August, 1888 (F. Bouskell).
Fluctuosa.—Near Market Harborough (Rev. A. Matthews); occurs June.
Diluta.—Knighton, August, 1888 (F. Bouskell); Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews).
Or.—Near Market Harborough (Rev. A. Matthews); occurs June and July.
Flavicornis.—Loughborough (J. Wieldt); occurs March.

BYROPHILA. *Glandifera.*—Near Market Harborough (Rev. A. Matthews); occurs July and August.
Perla.—Common July, August, and September.

ACRONYCTA. *Tridens.*—Near Loughborough, also larvæ; (J. Wieldt); Stoneygate, September, 1890, larvæ (C. B. Headly); Ashby de-la-Zouch, fairly common (Rev. G. A. Smallwood); occurs June.
Psi.—Common June.
Leporina.—Cloud Wood, Tonge (Rev. G. A. Smallwood); two or three specimens occur June.
Aceris.—Near Loughborough, larvæ (J. Wieldt); Bradgate, July 8, 1887 (F. R. Rowley); Gumley (Rev. A. Matthews).
Megacephala.—Near Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.

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Alni.—Larvæ, Stoneygate, 1890 (C. B. Headly); near Loughborough (J. Wieldt); Cloud Wood (Rev. G. A. Smallwood); Ashby-de-la-Zouch, 1881 (Rev. G. A. Smallwood; near Harborough (Rev. A. Matthews); occurs June.

Ligustri.—Larvæ, near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June and July.

Rumicis.—Larvæ, near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs May and June.

LEUCANIA. *Conigera.*—Bradgate and Stoneygate, July 23, 1887, July, 1888 (F. Bouskell); Aylestone, July 18, 1884 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Turca.—Loughborough (J. Wieldt); occurs June.

Lithargyria.—Stoneygate, August, 1888 (F. Bouskell); Loughborough (J. Wieldt), also larvæ; Gumley (Rev. A. Matthews).

Obsoleta.—Near Market Harborough (Rev. A. Matthews); occurs June.

Comma.—Common June and July.

Impura.—Common July and August.

Pallens.—Common June, July, and August.

NONAGRIA. *Fulva.*—Gumley (Rev. A. Matthews); occurs September.

Typhæ.—Near Loughborough, larvæ (J. Wieldt); Gumley (Rev. A. Matthews); occurs September.

Lutosa.—(Rev. A. Matthews); occurs August.

GORTYNA. *Flavago.*—Gumley (Rev. A. Matthews); occurs June.

HYDRŒCIA. *Nictitans.*—Common July.

Petasitis.—Stoneygate, September 8 and 18, 1890 (F. Bouskell).

Micacea.—Knighton, August and September, 1888; Stoneygate, August and September, 1890 (F. Bouskell and C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

AXYLIA. *Putris.*—Leicester, Knighton, Quorn, Swithland, Bradgate Gumley; not uncommon in June.

XYLOPHASIA. *Rurea.*—Knighton, June 14, 1884 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Lithoxylea.—Bradgate, July 6, 1885 (F. R. Rowley); Quorn, July, 1888 (S. Harris); Stoneygate, 1888 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Sublustris.—Fairly common July and August.

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Polyodon.—Very common June, July, and August.
Hepatica.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews; occurs June and July.
Scolopacina.—Gumley (Rev. A. Matthews); occurs July.

NEURIA. *Saponariæ.*—Loughborough (J. Wieldt); occurs July.

HELIOPHOBUS. *Popularis.*—Common August and September.

CHAREAS. *Graminis* —Common August and September.

CERIGO. *Cytherea.*—Blaby, July, 1885 (W. A. Vice); Gumley (Rev. A. Matthews).

LUPERINA. *Testacea.*—Fairly common August and September.
Cespitis.—Stoneygate, September 2, 1890 (F. Bouskell).

MAMESTRIA. *Abjecta.*—Knighton, July, 1888 (F. Bouskell); Gumley (Rev. A. Matthews).
Anceps.—Stoneygate, June, 1890 (F, Bouskell).
Furva.—Gumley (Rev. A. Matthews); occurs July.
Brassicæ.—Common June and July.
Persicariæ.—Common July.

APAMEA. *Basilinea.*—Common May and June.
Connexa.—Gumley (Rev. A. Matthews); occurs June and July.
Gemina.—Aylestone, July 7, 1886 (F R. Rowley); Loughborough (J. Wieldt); near Market Harborough (Rev. A. Matthews).
Unanimis.—Stoneygate, July, 1888 (F. Bouskell); Gumley (Rev. A. Matthews).
Fibrosa.—Gumley (Rev. A. Matthews); occurs July.
Oculea.—Common June and July

MIANA. *Strigilis.*—Common June and July.
Fasciuncula.—Leicester, June 5 and 6, 1884-5-6 (F. R. Rowley); Stoneygate, June, 1889 (F. Bouskell); Gumley (Rev. A. Matthews).
Furuncula.—Leicester, June 5, 1884-5-6 (F. R. Rowley); New Parks, July, 1889 (F. Bouskell); Loughborough (J. Wieldt).
Arcuosa.—Gumley (Rev. A. Matthews); occurs June and July.

GRAMMESIA. *Trilinea.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.

CARADRINA. *Morpheus.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June and July.
Alsines.—Loughborough (J. Wieldt); occurs July.
Blanda.—Common June and July.
Cubicularis.—Common June, July, and August.

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RUSINA. *Tenebrosa.*—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.

AGROTIS. *Valligera.*—Freeman's Common (F. R. Rowley); occurs July.
Puta.—Near Market Harborough (Rev. A. Matthews); occurs August.
Suffusa.—Loughborough (J. Wieldt); occurs September.
Saucia.—Loughborough (J. Wieldt); occurs October.
Segetum.—Common June.
Exclamationis.—Common June.
Corticea.—Loughborough (J. Wieldt); occurs June and July.
Nigricans.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.
Tritici.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.
Agathina.—Near Market Harborough (Rev. A. Matthews); occurs August.
Precox.—Gumley (Rev. A. Matthews); occurs July.
Ravida.—Near Market Harborough (Rev. A. Matthews); occurs July.
Pyrophila.—Near Market Harborough (Rev. A. Matthews); occurs July.

TRYPHÆNA. *Janthina.*—Common July.
Fimbria.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June and September.
Interjecta.—Blaby, 1887 (W. A. Vice); near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs July.
Subsequa.—Knighton, July, 1889 (F. Bouskell); Loughborough (J. Wieldt).
Orbona.—Common July to September.
Pronuba.—Common June to September.

NOCTUA. *Glareosa.*—Whitwick, August 19, 1884 (F. R. Rowley).
Augur.—Common July.
Plecta.—Swithland, June 27, 1889 (F. Bouskell); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
C. Nigrum.—Aylestone, July 11, 1887 (F. R. Rowley); Stoneygate, July, 1890 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Triangulum.—Near Market Harborough (Rev. A. Matthews); occurs June.
Rhomboidea.—Near Market Harborough (Rev. A. Matthews); occurs July.
Brunnea.—Monastery, August 6, 1884 (F. R. Rowley); Knighton, August, 1888 (F. Bouskell); near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Festiva.—Markfield Lane, July 7, 1885 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews.)

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Rubi.—Fairly common at Whitwick, Stoneygate, Loughborough, Gumley in August.

Umbrosa.—Whitwick, August; Leicester Cemetery, Loughborough, and Gumley.

Baja.—Whitwick, August, 1884 (F. R. Rowley); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Xanthographa.—Common July and August.

TÆNIOCAMPA. *Gothica.*—Common March, April and May.

Rubricosa.—Near Market Harborough (Rev. A. Matthews); occurs March and April.

Instabilis.—Common March and April.

Populeti.—Knighton, April 19, 1889 (F. Bouskell); Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews).

Stabilis.—Common March and April.

Gracilis.—Near Loughborough (J. Wieldt); near Market Harborough (Rev. A. Matthews); occurs April and May.

Miniosa.—Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs March and April.

Munda.—Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs March and April.

Cruda.—Very common March and April.

ORTHOSIA. *Upsilon.*—Near Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs September, October, and November.

Lota.—Stoneygate, November 11, 1889 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

Macilenta.—Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs September and October.

ANCHOCELIS. *Rufina.*—Near Loughborough (J. Wieldt); occurs September and October.

Pistacina.—Common September and October.

Lunosa.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews; occurs September.

Litura.—Stoneygate, September, 1889 (C. B. Headly); Loughborough (J. Wieldt); Harborough (Rev. A. Matthews).

CERASTIS. *Vaccini.*—Near Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs October, November, and December.

Spadicea.—Near Harborough (Rev. A. Matthews); occurs October and November.

SCOPELOSOMIA. *Satellitia.*—Knighton, October, 1886; Stoneygate, September, 1890 (F. Bouskell); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt).

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DASYCAMPA. *Rubiginea.*—Near Loughborough (J. Wieldt); occurs October.

OPORNIA. *Croceago.*—Gumley (Rev. A. Matthews); occurs September and October.

XANTHIA. *Citrago.*—Near Loughborough (J. Wieldt); occurs September.
Cerago.—Stoneygate, September, 1889 (F. Bouskell); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt).
Silago.—Stoneygate, September, 1889 (F. Bouskell); Loughborough (J. Wieldt); Harborough (Rev. A. Matthews).
Gilvago.—Near Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); occurs September.
Ferruginea.—Stoneygate, September, 1888-9 (F. Bouskell); Gumley (Rev. A. Matthews); Loughborough (J. Wieldt.)

CIRRHŒDIA. *Xerampelina.*—Stoneygate, September, 1890 (C. B. Headly); near Leicester Cemetery (B. Nevinson); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).

TETHEA. *Subtusa.*—Stoneygate, July 29, 1889 (F. Bouskell); Gumley (Rev. A. Matthews); Lount Wood, Ashby (Rev. G. A. Smallwood).
Retusa.—Gumley (Rev. A. Matthews); occurs August.

COSMIA. *Trapezina.*—Common July.
Pyralina.—Stretton Magna, August 19, 1890 (C. B. Headly).
Diffinis.—Knighton, July, 1886 (F. Bouskell); Stoneygate, September 3, 1890 (C. B. Headly); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Affinis.—Quorn, July, 1888 (S. Harris); Loughborough (J. Wieldt); near Harborough (Rev. A. Matthews) Willesley Park (Rev. G. A. Smallwood).

DIANTHÆCIA. *Capsincola.*—Gumley (Rev. A. Matthews); occurs August.
Cucubali.—Bradgate, July, 1885 (F. R. Rowley); Swithland, June 27, 1889 (F. Bouskell); Gumley (Rev. A. Matthews); Knighton, August, 1890, larvæ (C. B. Headly).

HECATERA. *Serena.*—Gumley (Rev. A. Matthews); occurs August.

POLIA. *Chi.*—Common July to September.
Flavicincta.—Leicester, September 17, 1884 (F. R. Rowley); Quorn, July, 1888 (S. Harris); Stoneygate, September 23, 1890 (C. B. Headly); Gumley (Rev. A. Matthews).

EPUNDA. *Nigra.*—Gumley (Rev. A. Matthews); occurs September and October.

MISELIA. *Bimaculosa.*—Gumley (Rev. A. Matthews).
Oxyacanthæ.—Fairly common September.

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AGRIOPIS. *Aprilina.*—Stoneygate (C. B. Headly); near Loughborough (J. Wieldt), also larvæ; occurs October.

PHLOGOPHORA. *Meticulosa.*—Leicester, April 26, 1884 (F. Bates); Knighton, August, 1886-7 (F. Bouskell); near Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews); Stoneygate, September, 1890 (F. Bouskell and C. B. Headly).

EUPLEXIA. *Lucipara.*—Not uncommon June and July.

APLECTA. *Herbida.*—Bradgate, July, 1885 (G. H. Storer); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews).
Occulta.—Gumley (Rev. A. Matthews); occurs July.
Nebulosa.—Bradgate, July, 1885 (G. H Storer); Loughborough (J. Wieldt); Harborough (Rev. A. Matthews); Lount Wood, Ashby, very common (Rev. G. A. Smallwood).
Tincta.—Stoneygate, July, 1888 (C. B. Headly); Gumley (Rev. A. Matthews).

HADENA. *Adusta.*—Stoneygate, May, 1889 (C. B. Headly); Gumley (Rev. A. Matthews).
Protea.—Common September.
Glauca.—Gumley (Rev. A. Matthews); occurs June.
Dentina.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews; occurs June and July.
Chenopodi.—Stoneygate, July, 1889 (F. Bouskell); Gumley (Rev. A. Matthews).
Suasa.—Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs June.
Oleracea.—Common June.
Pisi.—Loughborough and larvæ (J. Wieldt); Gumley (Rev. A Matthews); Ashby-de-la-Zouch (Rev. G. A. Smallwood; occurs June.
Thalassina.—Gumley (Rev. A. Matthews); occurs May and June.
Contigua.—Knighton, June, 1886-7-8-9 (F. Bouskell); Stoneygate (C. B. Headly); Gumley (Rev. A. Matthews).
Rectilinea.—Gumley (Rev. A. Matthews); occurs June.

XYLOCAMPA. *Lithoriza.*—Near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs March and April.

CALOCAMPA. *Vetusta.*—Near Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs September and October.
Exoleta.—Near Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews); occurs September and October.

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XYLINA. *Rhizolitha.*—Gumley (Rev. A. Matthews); occurs October.
Semibrunnea.—Gumley (Rev. A. Matthews); occurs September and October.
Petrificata.—Gumley (Rev. A. Matthews); occurs September and October.

CUCULLIA. *Verbasci.*—Gumley (Rev. A. Matthews); occurs April.
Scrophulariæ.—Gumley (Rev. A. Matthews); occurs May.
Umbratica.—Knighton, June, 1884-5-6-8 (F. Bouskell); Stoneygate, June, 1889 (C. B. Headly); Leicester, July, 1884-7 (F. R. Rowley); Coalville, Quorn, Spinney Hill, Loughborough, and Harborough.

HELIOTHIS. *Marginata.*—Gumley (Rev. A. Matthews); occurs May and June.

ANARTA *Myrtilli.*—Quorn, July, 1889 (S. Harris); Gumley (Rev. A. Matthews).

HELIODES. *Arbuti.*—Knighton (F. Carr); Loughborough (J. Wieldt); Gumley (Rev. A. Matthews); occurs May and June.

ERASTRIA. *Fuscula.*—Gumley (Rev. A. Matthews); occurs June and July.

EREPHOS. *Parthenias.*—Gumley (Rev. A. Matthews); Bradgate (C. B. Headly); occurs March.

HABROSTOLA. *Urticæ.*—Leicester, July 16, 1884 (F. R. Rowley); Knighton, August, 1887-9 (F. Bouskell); Loughborough and larvæ (J. Wieldt); Gumley (Rev. A. Matthews).
Triplasia.—Leicester, 1886 (F. R. Rowley); Stoneygate, August, 1889 (C. B. Headly); Gumley (Rev. A. Matthews).

PLUSIA. *Chrysitis.*—Common June to August.
Iota.—Common June and July.
V. Aureum.—Gumley (Rev. A. Matthews); Ashby-de-la-Zouch, common (Rev. G. A. Smallwood); occurs July.
Gamma.—Common June to September.

GONOPTERA. *Libatrix.*—Common August and September; (January, 1891, Stoneygate, T. Lawrence).

AMPHIPYRA. *Pyramidea.*—Bradgate, August, 1888 (C. B. Headly); Gumley (Rev. A. Matthews).
Tragopogonis.—Common July, August, and September.

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MANIA. *Typica.*—Common July, August, and September.
Maura.—Quorn, August, 1886-7-8-9-90 (S. Harris); Syston, 1886 (F. Bouskell); Stoneygate, September 3, 1890 (C. B. Headly); Loughborough (J. Wieldt); near Harborough (Rev. A. Matthews).

CATOCALA. *Nupta.*—Gumley (Rev. A. Matthews); occurs August and September.

EUCLIDIA. *Mi.*—Near Harborough (Rev. A. Matthews); occurs June.
Glyphica.—Near Harborough (Rev. A. Matthews); occurs June.

PHYTOMETRA. *Æmea.*—Near Harborough (Rev. A. Matthews); occurs June and July.

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THE SCRIBLERUS CLUB.

By C. J. Billson, M.A. (Read before Section "A.")

It is a common mistake to fancy that genius owes the better part of its inspiration to solitude. The biographies of great men do not teach so. The childish picture of the heaven-born poet sitting with his singing-robes around him beside some sequestered stream,

"Remote, unfriended, melancholy, slow,"

avoiding the fellowship and despising the conventions of his fellow-men, is almost wholly a fancy portrait. Certainly all the greatest poets have been men of the world—men in the world, at least, if not of it—men keenly interested in the existing order. And their inspiration has been drawn, I think, upon the whole, not so deeply from those "solitary musings" which Wordsworth regarded as the springs of his poetic stream, as from the warm contact of humanity, the clash of contending ideas, even, it may be, from the bare rivalry of wits. However this may be, and whether for good or evil, there can be no doubt that the majority of our great English writers, from Chaucer to Browning, have been "clubbable" men. The greatest of the Elizabethans, according to their fellow-poet, knew "no Elysium choicer than the Mermaid Tavern": in the 17th century Wills' Coffee-house, under the dictatorship of Dryden, attracted no inconsiderable share of the intellectual life of the age; and during the closing years of the reign of Queen Anne the deepest literary interest is centred in the "little senate" to which Addison laid down the law at Button's, and in the two famous Clubs which then owed their origin to the unresting energy of Swift. It is with the later of these that the present paper is concerned, but it may be well to say a few words, by way of introduction, about the earlier institution, the Society of Brothers.

This Club was founded in the month of June, 1711. It was composed of most of the foremost men of rank and talent in the Tory party, comprising the leading Ministers of Harley's Administration, with the exception of Harley himself, and their political supporters. But the objects of the Club were not confined to the consolidation of a party, and the interchange of Parliamentary gossip, or we should not be concerned to mention it in connection with the rise of Scriblerians. Apart from politics, the ambitious programme of the Brothers ranged from the advancement of conversation and friendship to the patronage of deserving writers, and fixing the standard currency of the English language. The Club endeavoured, in fact, to combine to some extent, and in a modest degree, the functions of the Carlton, the Athenæum,

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the Incorporated Society of Authors, and the French Academy. It consisted in its heyday of nineteen members—nine lords and ten commoners—and did not, of course, possess any clubhouse, but the members dined together every Thursday during the Parliamentary session at the Thatched House or some other London Tavern, when the political squibs of the day were laid upon the table, and subscriptions collected for needy authors.

It was based indeed in the noble mind of its founder upon the Brotherhood of Man, and to him its claim to exist depended upon its cultivation of that fraternal feeling which was outwardly expressed by the name of the Club and by the habit of its members, long surviving the dissolution of their membership, of addressing each other by the title of Brother, but more by the exercise of brotherly love and charity towards the unsuccessful. There are many sidelights upon this aspect of the Club in Swift's "Journal to Stella." Thus, on Feb. 12, 1712, he writes: "I dined to-day with our Society—the greatest dinner I have ever seen. I gave an account of sixty guineas I had collected, and am to give them away to two authors to-morrow. I was to see a poor poet, one Mr. Diaper, in a nasty garret, very sick. I gave him twenty guineas from Lord Bolingbroke, and disposed of the other sixty to two other authors." At another dinner the Club had voted £100, collected by Swift, to relieve the poverty of a young man who had been recommended to Swift by Addison. The next day Swift proceeded to execute his commission. "I took Parnell with me, and walked to see poor Harrison. I had the £100 in my pocket. I told Parnell I was afraid to knock at the door; my mind misgave me. I did knock, and his man, in tears, told me his master was dead an hour before. Think what grief this is to me! I could not dine with Lord Treasurer, nor anywhere else, but got a bit of meat towards the evening."

The kind-hearted man soon found, however, that the charity of club-dinners begins at home. "It cost me nineteen shillings to-day for my club-dinner," he remarks, Dec. 18, 1712. "I don't like it." The increase of luxury, as usual, defeated its own end. The attendance began to fall off, the meetings became irregular, and, after a life of some two years, the Brotherhood died a natural death.

It was out of the ashes of this extinct idea that Swift constructed a still more memorable scheme, which had more lasting effects upon English literature. He projected the Scriblerus Club. This Association has as much right to the title of a Club as Gargantua's Thelema to the title of Abbey, for, like that illustrious monastery, it was "constituted contrary to all others." It had no formal organization, no exclusive political colour, no clubhouse nor tavern, no definite roll of members. A few friends—Swift, Pope, Parnell, Arbuthnot, Gay, Congreve, sometimes Atterbury (Bishop of Rochester), occasionally Lord Bolingbroke, and perhaps one or two more—used to meet, apparently on Saturday evenings, in the rooms in St. James's Palace, which were occupied by Arbuthnot as Physician to the Queen. From an allusion in one of

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Arbuthnot's letters, it appears that Gay used to act as the Secretary and amanuensis of the Club. Another occasional attendant at the Scriblerian meetings was Harley, Lord Oxford (the Tory Prime Minister and Lord Treasurer), who would often characteristically leave his Ministerial labours at the most anxious crisis, and climb up the dark staircase in St. James's Palace to the genial society assembled in the doctor's rooms. These visits were often preceded by an interchange of verses between the Scriblerians and the great incapable statesman whom the others privately nicknamed "The Dragon." Thus, on June 12, 1714, when Swift was away from town, staying for a few days at Letcombe, Arbuthnot wrote to him: "'The Dragon' was with us on Saturday night last, after having sent us really a most excellent copy of verses. I really believe when he lays down he will prove a very good poet. I remember the first part of his verses was complaining of ill-usage; and at last he concludes:

> 'He that cares not to rule will be sure to obey,
> When summoned by Arbuthnot, Pope, Parnell, and Gay.'"

Here is a specimen of the invitations addressed to Oxford by the Club:

> "Let not the Whigs our Tory Club rebuke,
> Give us our Earl, the devil take their Duke.*
> Quædam quæ attinent ad Scriblerum
> Want your assistance now to clear 'em.
> One day it will be no disgrace
> In Scribler to have had a place;
> Come, then, my lord, and take your part in
> The important history of Martin."

And here is a note written in Swift's handwriting, dated from the doctor's chambers, "past eight":

> "The doctor and Dean, Pope, Parnell and Gay,
> In manner submissive most humbly do pray
> That your lordship would once let your cares all alone,
> And climb the dark stairs to your friends who have none:
> To your friends who at least have no care but to please you,
> To a good honest Junto that never will tease you." †

Upon another occasion, Pope, Swift, Parnell, Arbuthnot, and Gay each contributed a couplet, signed with the name of its author, and sent the rhymes down to draw the statesman from his den. It was probably the same members who conspired to write the popular song:

> "'Twas when the seas were roaring."

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* Marlborough.

† Alluding, of course, to the famous Whig Junto which was just at this time teasing Harley extremely.

Long after the dissolution of the Club on July 8, 1718, Pope, Gay, and Parnell met at the Ship Tavern and there wrote some doggrel verses to Lord Oxford in Lincoln's Inn, requesting that he would admit them. The lines are dated "5 o'clock," and Oxford replied in worse doggrel that he would receive them till eight.

Lord Oxford, writing to Pope in 1721, says: "I look back to those evenings I have usefully and pleasantly spent with Mr. Pope, Mr. Parnell, Dean Swift, the doctor, &c. I should be glad the world knew you admitted me to your friendship."

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This song has been attributed to Gay alone—by Professor Edmund Gosse, for example, in his "History of Eighteenth Century Literature"; by Campbell in his "British Poets; and even as early as the year 1765, in "The Brent" or "English Syren:" but there is evidence that other members of the Club had a hand in it. In a letter written to Wm. Unwin, Aug. 4, 1783, Cowper says: "I have been well-informed that they all contributed, and that the most celebrated association of clever fellows this country ever saw did not think it beneath them to unite their strength and abilities in the composition of a song. The success, however, answered their wishes." It is possible that the song was fathered upon Gay alone, from its being written down in his handwriting while he acted as amanuensis to the Club, and also from its being introduced into the "What d'ye call it?"—a play written in other respects by Gay alone. But I have been unable to trace the source of Cowper's information.

Such private meetings of friends would appear to have little title to name or remembrance, especially since, in a very few months, the death of Queen Anne on Aug. 1, 1714, brought them to an abrupt close; when the members of the "little senate" were disbanded: Oxford was sent to the Tower, Swift retired to Ireland, Bolingbroke fled into exile, and Arbuthnot, losing his post with his patient, was obliged to give up his rooms in St. James's Palace.

But these informal gatherings of the Scriblerus Club had influences which reached very far beyond their immediate source. Two, if not three classics of English literature may be said to date from them, beside many literary productions of a lower order. The main issue of the Scriblerus meetings was the project of a satire on the abuses of human learning, to which all the members of the Club were to contribute. The original design of this great work was taken from Cervantes: it was intended to contain the life, adventures, and critical works of one Martin Scriblerus, a type of the dry-as-dust pedant, and in its vast scope to invade with ridicule every province in the great Kingdom of Dullness.

The origin of the name "Scriblerus" is self-evident: his Christian name is a subtle suggestion of the leading spirit of the work, for it was the habit of the "Dragon" Oxford to confound two birds of a feather by giving the name of "Martin" to the man who bore the name of "Swift."

Swift, Pope, and Arbuthnot, the most illustrious triumvirate of satirists then living,* were the principal originators of the scheme; and had Queen Anne been spared from apoplectic fits another winter, the world would doubtless have been presented with its most colossal monument of intellectual scorn. As events happened, the full design was never carried out; but disjointed members of the work remained in

* Addison was incontestably the greatest *humourist* of his age, but in pure satire inferior to the three writers above-mentioned. His satire has everything except the chief note of satire "indignation." He was not a member of the Scriblerus Club, chiefly perhaps because he was a Whig; though Spence says that "he was not disinclined to come into it."

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existence, and the spirit which inspired it survived the dissolution of the Club and passed into other forms.

Some attempts were made, indeed, to revive the Scriblerian meetings after Queen Anne's death. Thus, in a letter written on Sept. 2, 1714, to Arbuthnot, the first part of which was contributed by Parnell, and the latter half by Pope, the former says: "It is a pleasure to us to recollect the satisfaction we enjoyed in your company when we used to meet the Dean and Gay with you; and greatness itself condescended to look in at the door to us. Then it was that the immortal Scriblerus smiled upon our endeavours, who now hangs his head in an obscure corner, pining for his friends that are scattering over the face of the earth. Yet art thou still, if thou art alive, O Scriblerus, as deserving of our lucubrations." To which Pope adds: "I hope the revolutions of state will not affect learning so much as to deprive mankind of the lucubrations of Martin, to the increase of which I will watch all next winter, and grow pale over the midnight candle. . . . The remembrance of our agreeable conferences, as well as our occasional honours on your account, will ever dwell upon my thoughts with that pleasure which I think one honest and cheerful man ought to take in being obliged to another. That we may again enjoy those satisfactions is heartily my wish." To this letter Arbuthnot replied that "Martin's office is now the second door on the left hand in Dover-street, where he will be glad to see Dr. Parnell, Mr. Pope, and his old friends, to whom he can still afford a half-pint of claret. . . . I will never forgive you if you do not use my foresaid house in Dover-street with the same freedom as you did that in St. James's."

There can be little doubt that Pope and Gay made use of the doctor's invitation, and that the house on the left hand side of Dover-street witnessed some faint revival of the meetings at St. James's. Parnell, however, soon retired to the Irish vicarage which Swift obtained for him, and died in the course of the next three years; so that Arbuthnot, Pope, and Gay* were the only three Scriblerians left in London. Their first attempt to carry out the traditions of the Club proved a failure. Putting on one side the half-written "Memoirs of Scriblerus," they united to write a play ridiculing the rigid criticism of Pope's great enemy, Dennis, and the pedantry of Dr. Woodward, the antiquary and geologist, a favourite butt of the Scriblerian doctor. The farce, which was called "Three Hours after Marriage," was produced in January, 1717, and hissed off the stage. It is only fair to Pope to add that he appears to have had less to do with this piece than his two confederates, and that, as Gay admits in one of his letters, "Pope disapproved of the idea of it."

After this hasty and ill-considered production, Scriblerus was silent for ten years, after which interval the matured fruit of the Club's great

* Gay had returned from his brief visit to Hanover as Secretary to Lord Clarendon, in the autumn of 1714.

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design was at length given to the world. In the summer of the year 1726 Dean Swift came over to England and stayed four months with Pope at his Twickenham villa. It must have been something like a restoration of the old days of Queen Anne when Pope gave a dinner-party at his villa on the 6th July in that year, and the party consisted of Pope, Swift, Bolingbroke, Congreve, and Gay—all the surviving members of the Club except the doctor.

The visit awoke ideas which had long lain dormant. Swift then, as ever, proved the great original and master mind. Indeed it is, perhaps, the highest mark of Swift's supreme genius that he was so constantly the exciting cause of genius in others. He had in his pocket the manuscript of his own contribution to the Scriblerian satire, "The Travels of Lemuel Gulliver," which were published before the end of that year; he snatched from the fire the rough draft of a poem which his host was about to destroy, and inspired him to complete it and publish "The Dunciad"; he suggested a plot to Gay, and spurred His Serene Laziness to write "The Beggar's Opera." Another result of his visit was a resolve to publish in the form of Miscellanies such of the less important writings of the Scriblerians as they might think worth preserving. The first two volumes of these Miscellanies were printed by Benjamin Motte, in June, 1727; the third appeared in the following March.

On Jan. 29, 1728, was produced "The Beggar's Opera," and so splendid was its success that, as Swift said, it quite knocked down Gulliver. On the 28th May in the same year appeared "The Dunciad," which, in its turn, eclipsed "The Beggar's Opera."

A more strikingly brilliant result of those evenings spent at St. James's Palace fourteen years before can hardly be imagined. "Gulliver's Travels," "The Dunciad," "The Beggar's Opera"—these are—

"Familiar in men's mouths as household words,"

and have made acquainted with the satire of Scriblerians multitudes to whom the name of Scriblerus is an unknown quantity. But the miscellaneous writings of the Club are not so generally known, and I shall not be encroaching upon such common ground if I devote the rest of this paper to a brief notice of some of the more important of them.

Of the "Life or Memoirs of Martin Scriblerus" only one book has been preserved, though more appears to have been written, for Spence says that "the design was carried on much further than appears in print." The loss of the rest it is easy to understand, for the carelessness with which Arbuthnot kept all his manuscripts is notorious. In a letter to Pope he writes that "the lucubrations of Scriblerus lie neglected amongst old newspapers, cases, petitions, and abundance of unanswerable letters." Fortunately, the manuscript of the first book of the Memoirs passed into Pope's hands at the doctor's death in 1735; and it would seem that Pope had also preserved some notes for the unwritten portions, for Spence says in his "Anecdotes" that in the list of papers ordered to be

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burnt (presumably by Pope's executor after his death) were "the pieces for carrying on the Memoirs of Scriblerus," for which Spence adds that he interceded in vain.

The first book of the Memoirs appears to have been written during the sittings of the Club in the spring and summer of 1714, and was published by Pope twenty-seven years afterwards in the 1741-2 edition of his own works. It was thus, though the first written, the last to appear of all the Scriblerian writings. In it are satirized the follies of law, medicine, education, metaphysics, archæology, and history, and the greater part seems to be the work of Arbuthnot, though there are traces in it of the hands of Pope and Swift.

Martin Scriblerus, the prince of pedants, is, as one might suppose, of German extraction; but he was born in England—in fact in Seven Dials. His father, Cornelius Scriblerus, a very learned antiquary, was delighted at the birth of a son, whom he determined to educate into a prodigy of learning. Imagine his joy when he discovered that the infant possessed the wart of Cicero, the wry neck of Alexander, knots upon his legs like Marius, and one of them shorter than the other, like Agesilaus! "The good Cornelius also hoped he would come to stammer like Demosthenes, and in time arrive at many other defects of famous men." The greater part of this fragment of the life of Scriblerus is occupied with an elaborate description of his education, imitated from Rabelais' account of the early training of Gargantua, and quite as extravagant. Sterne was incalculably indebted to it when writing the first part of "Tristram Shandy." The dissertation upon the games of young Martin is as learned a piece of fooling as anything in the great French humourist. His father would not of course allow him to play at any modern games, but having discovered that the ancient "harpastus" still flourished in Cornwall under the name of "hurling," he packed his son off to the West to join in that classical sport. The clumsy little precocity only succeeded, however, in breaking one of his bandy legs, and his father was thus constrained to confine his education for the future to more sedentary pursuits. He was initiated into the study of Rhetoric, and at a very early age composed the "Treatise on Bathos," which occupies the first place in his works, and which we shall notice presently. In order to complete his training in Logic and Metaphysics, Cornelius engaged another boy, named Conradus Crambe, to dispute with him upon these topics. Their "Debates" contain some exquisite satire upon Locke's celebrated essay (published about ten years before the formation of the Club). For a taste let me quote a brief passage, in which that philosopher's theory of abstract ideas is ridiculed perhaps with more humour than justice.

"His father asked him if he could not frame the idea of an Universal Lord Mayor. Martin told him that never having seen but one Lord Mayor, the idea of that Lord Mayor always returned to his mind; that he had great difficulty to abstract a Lord Mayor from his fur gown and gold chain; nay, that the horse that he saw the Lord Mayor ride upon not

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a little disturbed his imagination. On the other hand, Crambe, to show himself of a more penetrating genius, swore that he could frame a conception of a Lord Mayor, not only without his horse, gown, and gold chain, but even without stature, feature, colour, hands, head, feet, or any body; which he supposed was the abstract of a Lord Mayor. Cornelius told him that he was a lying rascal."

In Metaphysics it is interesting to note that the sophistries of the schoolmen are still, less than 200 years ago, the objects of satire. Martin and his companion are set to debate before Cornelius and his learned friends upon Theses, culled chiefly from Thomas Aquinas, and very similar to those which, a century later, Charles Lamb, in a celebrated whimsical letter propounded to Coleridge. One of these theses is, "Whether God loves a possible angel better than an actually existent fly?" Another (very Lamby one) asks "Whether angels know things more clearly in a morning?" (This is actually one of Aquinas's problems.) The last is the most profound of all: "Whether, besides the real being of actual being, there be any other being necessary to cause a thing to be?" The study by young Martin of Anatomy and Physics gives Dr. Arbuthnot an opportunity of writing a very caustic and learned satire upon his empirical brethren. Martin became such an excellent grave physician, that he could cure all his patients, *except those who laughed.* But he pursued his investigations beyond the bodies of men, and, like other wise doctors of his age, endeavoured to discover the seat of the soul; upon which he received a letter from the Society of Freethinkers, pointing out the absurdity of such a pursuit in words which parody the arguments of Anthony Clarke in his "Discourse on Free Thinking." The fragment closes with a list of Scriblerus' works and discoveries, and some hints of his travels, the latter of which contain the germ of Gulliver's first three voyages.

"In his first voyage he was carried by a prosperous storm to a discovery of the remains of the ancient Pygmæan Empire. In his second he was as happily shipwrecked on the Land of the Giants, now the most humane people in the world. In his third voyage he discovered a whole kingdom of philosophers, who govern by the Mathematics."

I am glad to think that this passage may be accepted as satisfactory evidence that the last and most savage book of Gulliver, the Voyage to the Horses with the unpronouncable name, formed no part of its author's original plan, and was not conceived at the most sane period of his life.

The first work attributed to the precocious pen of Martin Scriblerus is the Treatise on Bathos, or the Art of Sinking in Poetry, which appeared in the third volume of the "Miscellanies," published in 1728. It was written entirely by Pope, and extracted from the mediocre poets therein victimised the mediocre satire called the "Popiad." It is an extremely witty burlesque upon those modern verse-writers who possessed, like Falstaff, a "certain alacrity in sinking." The authors

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laid under most frequent contribution are Sir Richard Blackmore, Theobald, Waller, Denham, Tickell, and Ambrose Phillipps, especially the first-named. Sir Richard Blackmore, the "everlasting Blackmore" of "The Dunciad," a family doctor with a highly respectable practice, who was knighted by William III., and beguiled his serious leisure with the composition of epics, often "writ to the rumbling of his coach's wheels," is now chiefly remembered from the ridicule of Pope, who dubbed him, not unfairly, "the father of Bathos, and indeed the Homer of it." Let us be content with one instance from his poem of "Job," in which he enhances Job's famous description of the war-horse in the following couplet:—

> "His eye-balls burn; he wounds the smoking plain:
> And knots of scarlet ribbon deck his mane."

I need give no more examples, for the man who could write that could write anything.

The chapter in this treatise which inspired the "Popiad" was the sixth, in which a great number of the writers of Pope's time are described and ridiculed under the names of certain animals and birds. The little wasp of Twickenham did not omit to add the correct initials of the human representatives of bird and beast, although he characteristically denied that he intended to aim at any writers in particular. The publication of the treatise seems to have been devised by Pope in order to compel from his dunces such retaliation as might seem to justify the publication of "The Dunciad," which had been long finished, and was only waiting for some justification of its savage temper.

The next work of Scriblerus in the "Miscellanies" is also by Pope, the "Virgilius Restauratus," a clever parody upon Bentley's "Scholia," especially ridiculing his emendations of Milton. Of more interest to the general reader is the very humorous specimen of Scriblerus' law reports. It appears to have been written by Pope in combination with his friend and legal adviser, Fortescue, afterwards Master of the Rolls, who supplied the law and perhaps some of the wit. The case reported is *Straddling* v. *Styles*, and should be read by all who are not acquainted with one of the choicest examples of legal burlesque.*

Besides ridiculing the follies of law, scholarship, and poetry, the "Miscellanies" contain a witty satire upon the loose philosophical speculations of the day. The piece is called "An Essay of the learned Martin Scriblerus concerning the Origin of Sciences; written to the most learned Dr. ——, F.R.S., from the Deserts of Nubia"; and purports to prove that all learning was derived from the monkeys of Ethiopia; the design of it being, according to Pope, to ridicule such as build general assertions upon two or three loose quotations from the ancients. It is said by Warburton to have been written by Parnell, but

* The "case" was this:—

Sir John Swale, by his will, bequeathed to Matthew Stradling, Gent., "all his black and white horses." *The testator had six black horses, six white horses, and six pied horses.* "The debate, therefore, was whether or no the said Matthew Stradling should have the said pied horses by virtue of the said bequest."

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from Spence's anecdotes it appears that both Pope and Arbuthnot assisted in its composition.

The argument runs thus: The most ancient empire and civilization of the world was that of the Pigmies, of whom we have accounts in Homer and Aristotle, and the survivors of whom, upon the decay of their civilization, retired into the depths of their deserts where they lived undisturbed till they were found out by Osiris in his travels to instruct mankind. "He met," says Diodorus, "in Æthiopia a sort of little satyrs who were hairy one half of their body, and whose leader, Pan, accompanied him in his expedition for the civilizing of mankind. For did not the very gods resort for twelve days every year to Æthiopia to learn wisdom from the Pigmies?" The writer then shows how the old wisdom of India was derived from the celebrated expedition of Bacchus and Silenus, the latter of whom was evidently descended from the Pigmies, for had he not a tail? So Orpheus, with Pan and other satyrs, brought the light of science to Greece, in which country the acutest wits were palpably of the genus *sylvestris homo*—Æsop, for instance, "whose name signifies the same thing as Æthiop," and whose appearance, not less than his great knowledge of beasts, betokened his kinship with them. And did not the smug-nosed Socrates display in every feature the lineaments of his race? To Italy these Sylvan philosophers brought the sciences, passing under the name of Fauns, which is derived, according to Livy, from *fando*, speaking. Yet, even there, as many examples prove, these philosophers were constantly tending to revert back to their old type. Now they have entirely gone back to it, and are known only by the same appellation as the man-tiger and the monkey. In order to bring about a true renaissance of culture, they must be recalled to the world. We must invite learned beasts to teach us; "the man-tigers to instruct our heroes, statesmen, and scholars; baboons to teach courtesy and address to courtiers; monkeys the art of pleasing in conversation, and agreeable affectations to ladies and their lovers; apes of less learning to form comedians and dancing-masters, and marmosets court-pages and young English travellers."

In the year 1724 was published in two folio volumes Bishop Burnet's "History of my own Times," and it was hardly to be expected that so typical a specimen of the self-important gossip-monger should escape the irony of Scriblerus. The Bishop's History is most amusingly and good-naturedly burlesqued in the "Miscellanies" by Pope, under the title, "Memoirs of P.P., Clerk of this Parish." "The original of the following extraordinary treatise," says Pope in the advertisement of the piece, "consisted of two large volumes in folio, which might justly be entitled 'The Importance of a Man to Himself.' But as it can be of very little to any body besides, I have contented myself to give only this short abstract of it, as a taste of the true spirit of memoir-writers."

Then follows a familiar account of the life of the virtuous Clerk, and of his companions, Robert Jenkins, farrier; Amos Turner, collar-maker; George Pilcocks, late exciseman, and Thomas White, wheel-

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wright. "After this the whole book is turned on a sudden from his own life to a history of all the publick transactions of Europe, compiled from the newspapers of those times. I could not comprehend the meaning of this, till I perceived at last, to my no small astonishment, that all the measures of the last four years of the Queen, together with the Peace of Utrecht, which have been usually attributed to the Earl of Oxford, Duke of Ormonde, Lords Harcourt and Bolingbroke, and other great men, do here most plainly appear to have been wholly owing to Robert Jenkins, Amos Turner, George Pilcocks, Thomas White, and, above all, to 'P.P.'"

Here we may end our notice of the "Scriblerian Miscellanies," the remaining pieces of which contain little but coarse personal invective against the enemies of Swift and Pope.

It may be interesting, however, to note that echoes of Scriblerus still lingered upon the air after Death had put all his original discoverers to silence. In the year 1751 was published "The Scribleriad," a mock heroic poem in six books, whose hero was our old friend Martin, and which aimed at ridiculing false science and false taste in the Scriblerian vein. It was the work of Richard Owen Cambridge, a Gloucestershire gentleman, who in that year took up his residence in the inspiring neighbourhood of Twickenham, a kindly cynic, of whom little is recorded, except that he drank nothing but water and rode hard to hounds.

The poem was sufficiently popular to reach a second edition, to which a long preface was attached, explaining its intention and allusions, but its interest was hardly more than ephemeral, and it lacked that element of greatness which has preserved from rust the satire of Gulliver and the invective of Pope.

For the original satire of the Scriblerus Club was no superficial product, no artificially-manufactured expression of the contempt of a certain set of clever fellows for the prevailing dullness. On the contrary, those who are best acquainted with the history of the eighteenth century will be the first to recognize in it the voice of the people, the earliest whisper of that sense of the corruption of Society and that revolt from external authority which culminated in the French Revolution of '89, and opened the door to a new world both in Politics and in Literature. It is a long step, to be sure, from the "Treatise on Bathos" to the Storming of the Bastille; but from thought to action is always an immeasurable distance. We can only see darkly that the spirit which drove the Scriblerians to measure sword and rapier with a predominant system of shams is the same spirit to which this nineteenth century owes all its peculiar freedom of thought and action; and perhaps at no point in the history of the long War of Humanity (unless it be in France during the sixteenth century*) have any body of sharp-shooters rendered such timely service in clearing the way beforehand for the imminent march of men.

* I am thinking, of course, of the famous *Societe Angelique* of Lyons, to which belonged Rabelais, Etienne Dolet, Desperiers, &c., and which has many interesting points of resemblance to the Scriblerus Club, apart from the obvious parallel of Gargantua and Gulliver.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

January 20th, 1891.—Present: The Chairman and eight members.

Paper read by Mr. THOMAS CARTER, LL.B., on "Elizabethan Music."

Resolution, moved by Mr. J. SCAMPTON, and seconded by Mr. F. S. HEARNE, and carried, "That a sum not exceeding four guineas be asked from the Council to be granted to Section "A" for the object of circulating Periodicals amongst the Members."

Resolution, moved by Mr. A. H. PAGET, and seconded by Mr. THOS. CARTER, LL.B., and carried, "That if the Council agree to the request the following periodicals be taken:—'Notes and Queries,' 'Antiquary,' 'Economic Review,' 'Journal of Folk Lore,' 'Leicestershire Notes and Queries."

February 17th, 1891.—Present: the Chairman and ten members.

The Chairman reported "that the Council had agreed to a grant of four pounds to the Section for the purchase of Magazines."

Resolution, by Mr. A. P. HARPER, M.A., seconded by Mr. T. C. LEE, and carried, "That the following Magazines be added to the previous list to be taken by the Section, viz.:—'Journal of Economics,' 'Forum.'"

The Paper of the evening was contributed by Mr. C. J. BILLSON, M.A., on the "Scriblerus Club," and, in the unavoidable absence of the writer, was read by the Chairman. (Printed at page 333).

March 17th, 1891.—Paper by Mr. A. P. MOORE, M.A., on "The Study of Philosophy." (Printed at page 286)

Mr. J. M. GIMSON was elected Chairman of the Section for the next Session, and Mr. F. S. HEARNE was elected Secretary.

W. SIMPSON, *Chairman.*

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SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

December 10th, 1890.—Mr. MOTT presented the Report of the Sub-Committee appointed to consider the Plan of the Proposed Herbarium for Leicestershire, and exhibited specimens of paper for mounting the specimens. The main points decided on by the Committee were as follows :—

(1.) Each sheet of specimens should have "Leic. Herb" printed on the right hand top corner.

(2.) The size of the paper to be 10 in. by 16 in.

(3.) Each Genus to be contained in one (or more) coloured wrappers.

(4.) The arrangement to be that of the "Flora of Leicestershire."

(5.) A special label to be printed on rather thin gummed paper, and a supply given to all who may wish to assist.

(6.) Each species to be fully represented, in all particulars.

(7.) In cases where a particular species is recorded from all the Districts, only one fully representative specimen of such species to be preserved; but in all other cases a specimen to be preserved from each District and from each Locality in each District (if such be given in the "Flora.")

(8.) The mounting of the specimens to be the same as that adopted at the Kew Herbarium.

(9.) The Herbarium Cabinet to be 4 ft. high, 2 ft. broad, and 18 in. deep.

Mr. MOTT also reported that the General Council had made a grant of £6 to purchase the necessary paper, labels, and cabinet, according to the request made by him on behalf of the Section, for which the Section duly returned their thanks.

Paper.—Mr. MOTT read a Paper on "Weeds," (printed at page 302.)

In the Discussion that followed, it was pointed out (1), that weeds are harbourers of noxious insects (*e.g.*, the Charlock of the Turnip "Fly" or Beetle). (2.) That Biennials (as many Thistles) can be eradicated by mowing every year, before the seeds are ripe, and thus preventing a *fresh* supply of seeds beyond those already in the ground. As these can lie dormant for years, one year's mowing will not be sufficient. (3.) That the Thistle *seeds* do not, probably, travel very far at a time (not more than twenty or thirty yards at most), as the "down," so often

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seen blown about, is merely, in most cases, the pappus from which the seed has dropped. (4.) Mr. Mott and Mr. Vice considered that birds did much good by eating the seeds of weeds. (5.) That the rank taste of butter, especially in July, is caused by the cows eating the seeds of *R. acris*. Doubt was expressed as to whether Daisies and Plantains were noxious. (6.) The food corn and wool, brought to this country from abroad, were fertile sources of the spread of weeds in our fields. (7.) In reference to the desirability of Parliamentary interference for the extermination of weeds, it was pointed out that bad farming (to which the spread of weeds was mainly due), as well as the existence of Coppices and Hedgerows, in which they would always take refuge, presented serious objections to such interference.

Exhibitions.—Specimens of *Tasmannia aromatica* and *Mnium undulatum*, by Miss HOTTINGER.

Nests of the Builder Bird from central India, by Mr. BARFOOT.

Specimens of *Orobanche elatior*, from Kibworth, and of *Viola lactea* and *Vicia tenuifolia* from the New Forest, by Dr. FINCH.

Home Reading Circle.—Mr. MOTT called attention to the Elm being called "Witch Hazel"—a name for it formerly not uncommon in Wilts. He also questioned whether cellulose was *dead* matter, and whether chlorophyll was distinct from protoplasm. The CHAIRMAN regretted that an edition of White's "Selborne" had been recommended, which did not contain corrections of the numerous statements which have since been found to be incorrect.

January 21st, 1891.—Paper.—The CHAIRMAN read a Paper on "Gentians." (Printed at page 307.)

Specimens of almost all the European species were exhibited.

Exhibitions.—Dried plants from Palestine, by Miss HOTTINGER. Pod of the "Silk Cotton," and the case of the larva of some large moth, from the East Indies, by Miss GRUNDY.

Mr. CARTER laid before the Section the offer of a Swedish Association, established at Fahleen, to exchange Botanical Specimens.

Home Reading Circle.—The CHAIRMAN pointed out the methods by which the two water Beetles, *Hydrous piceus* and *Dytiscus marginalis* obtained a supply of air. The former elevates its *head* above the surface of the water, and by a peculiar movement of the antennæ, causes the air to descend to the *under* surface of the body, which then presents the appearance of burnished silver. The *Dytiscus*, on the other hand, elevates its *tail* above the surface of the water, and stores away air under its elytra.

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February 16th, 1891.—Mr. MOTT reported that the Council of the Society had made a grant to the Section of a sum, not to exceed £4, for the purchase of Periodicals for circulation among the Section. The Periodicals selected were—"The Journal of Botany," "The Kew Bulletin," "The Annals of Botany," "Nature," "Science Gossip," and the "Westley Society's Magazine."

Paper.—The Rev. W. AGAR read a Paper on the "Value of the Poetic Spirit to the Scientific Worker." (Printed at page 294.)

Exhibitions.—Dried plants from Hyères, and from Glion, near Montreux, by Mr. E. F. COOPER.

Tubers of *Stachys tuberifera*, a native of China, esculent, and cultivated for the table at Gopsall Hall, by Mr. MOTT.

Model of portion of the stem of an Exogenous Tree, three years old, by Miss EMILLE.

Home Reading Circle.—Mr. MOTT differed from Materialistic Scientists in their view, that the individual was less worthy of regard than the species. He also questioned whether annuals could be made perennials by any artificial prevention of seeding. He thought that the object of individual life is to fully develop the germ into perfection.

Mr. MOTT proposed the question, "*How* does Light enable Chlorophyll to absorb Carbon?" Mr. GRUNDY thought that it was due to the vibrations produced on the carbon atoms. Mr. E. F. COOPER thought that the action of Light was similar to that of Heat, by stimulating combination. Mr. MOTT thought that Light imparted energy to the chlorophyll, and that this energy, being there transmuted into chemical affinity, enabled the chlorophyll to seize the carbon from the grasp of the oxygen.

T. A. PRESTON, *Chairman.*

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SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

December 8th.—The Rev. R. W. LANCASTER, M.A., of Beaumanor Villas, Aylestone Road, was elected an Associate of the Section, on the proposition of Mr. MONTAGU BROWNE.

A Paper entitled "Notes on Australian Bird Life," was communicated by Mr. F. F. How.

The writer, a resident in Victoria, described at some length the appearance and habits of many of the typical birds of the region, the notes on several of the species being specially interesting as, for instance, that portion dealing with the gradual extermination of the Lyre bird (*Menura superba*). the evidence given showing very clearly how these interesting and characteristic birds were decreasing in numbers yearly owing to the demand for the beautiful lyre-shaped tail, which finds a ready sale to tourists; and that, though the birds were protected by law, yet those who shot them often escaped punishment owing to the fact that mere possession of the tails was not sufficient to procure a conviction. Attention was also called to the great damage inflicted on crops of all kinds, both fruit and vegetables, by the crows, which, it was stated, seemed to be developing strong vegetarian tastes, and were rapidly becoming a scourge to the hard-working settlers of the colony.

Most prominent, perhaps, amongst the remaining birds mentioned, was the Bower Bird (*Ptilonorhynchus violaceus*), with its curiously constructed "bower" or arbour, formed of twigs and small branches, arching over above, and open at each end, decked with gay and shining materials, such as bleached bones, snail shells, and feathers. These "bowers," constructed principally by the male, and ornamented entirely by the female birds, constituted a favourite rallying place and playground for both sexes. The habits of the singular little Emu Wren (*Stipiturus*), which breeds in the swamps on Long Island, and in other localities, were described, and the gorgeous Rifle Bird, with its plumage of metallic green and black, shot with purple, also claimed attention. In the concluding portion of the paper some interesting details were given, relative to the process of Ostrich farming in Victoria.

After a short discussion, a hearty vote of thanks was accorded to the writer of the paper, and to Mr. F. F. How, on the proposition of the Chairman. The paper was illustrated by a magnificent series of photographs of Australian forest scenery, and also by a choice selection of the Australian Avi-fauna, including specimens of the Regent Bird (*Sericulus melinus*), Brush Wattle Bird (*Anthochæra carunculata*), Diamond Bird (*Pardalotus punctatus*), Bower Bird (*Ptilonorhynchus violaceus*), Rifle Bird (*Ptilorhis paradisea*), Piping Crow (*Gymnorhina tibicen*), Lyre

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Bird (*Menura superba*), male and female; Blue Wren (*Malurus*), Giant Owl Swallow (*Podargus humeralis*), Laughing Kingfisher (*Dacelo gigantea*), Swainson's Lorikeet (*Trichoglossus novæ-hollandiæ*), Undulated Grass Parakeet (*Melopsittacus undulatus*), &c., principally the property of Mr. How, but for the loan of a few of which, he expressed his indebtedness to Messrs. Montagu Browne and G. H. Storer.

The Vice-Chairman (Mr. MONTAGU BROWNE) gave some particulars concerning a small collection of local lias ammonities recently procured by himself and Mr. C. FOX STRANGWAYS, from an exposure at Loseby. Owing to conflicting evidence as to the true position of the beds from which they were obtained, the specimens in question were referred to a well-known Palæontologist for identification, who gave as his opinion that they were derived from the *bucklandi* beds of the Lower Lias. This statement being considered very unsatisfactory by Mr. BROWNE, Mr. S. S. BUCKMAN, F.G.S., the well known authority on such matters, was asked for his opinion. In his report he stated that he considered them as characteristic of the top bed (*raricostatus* zone) of the Lower Lias—a statement agreeing in the main with the field observations made by Mr. STRANGWAYS and Mr. BROWNE—and his determination of the species sent, resulted in the addition of three new Ammonites to the county list, and one doubtfully new. In addition to this, it was interesting to find that, whereas Professor JUDD chronicled sixteen other species of Invertebrates from the same Section, Mr. BROWNE procured twenty additional ones, making thirty-six in all, and that four of these were new to the county.

January 19th.—A discussion took place on the question of applying to the Council for a grant of money to be expended in the purchase of current scientific literature, for circulation amongst the members. It was finally decided to elect a Sub-Committee, consisting of the VICE-CHAIRMAN, SECRETARY, and Messrs. BOUSKELL and BAKER, to draw up a list of desirable magazines. Mr. W. A. VICE very kindly volunteered to lend his copy of "Science Gossip" monthly, for distribution with the other publications.

Mr. W. P. PYCRAFT read a Paper entitled "Notes on some Malformations of the Bill in Birds," in which, after describing the structure of a typical bill with its bony core ensheathed by a horny covering or Rhamphotheca, and describing also the principal modifications of the bill in various orders of birds, showing at the same time how these modifications were traceable to varying habits of life, he went on to allude to various departures from the normal type, mentioning first the interesting case of the varying length of the bill in the Mealy Redpoll at different seasons of the year—long in summer and short in winter—due to the altered nature of the food at those times, but which, before the true explanation was forthcoming, had led ornithologists to separate the

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long and short-billed forms as distinct species. In this connection mention was also made of cases in which birds, possessing bills capable of attacking hard substances, had, when kept in confinement and supplied with soft food material, suffered from great overgrowth of the horny sheaths, necessitating operative interference in order to enable the birds to feed. An interesting instance of malformation or overgrowth, resulting from accident, was presented by a Starling with the under mandible much longer than normal, whilst another starling, in which the under mandible was much lengthened and curved upwards, was exhibited as showing malformation due, not to accident, but to some disturbance arising during embryonic life. Mr. PYCRAFT next described and exhibited a most singular distortion affecting the facial portion of the skull of a domestic Duck. The derangement of the parts was well marked at the time of hatching, and consisted in the twisting of the bill to such an extent, as to force the right side of the mandible back upon the head, the right nostril being quite obliterated. A dissection showed the bones of the region to be much bent and displaced. Another interesting specimen was a Hooded Crow, in which the mandibles were not only very small, but crossed one another, after the manner of a Crossbill. Mr. PYCRAFT also called attention to the singular bills possessed by the Spoonbill and Scissorbill, which presented instances of extraordinary natural developments.

At the conclusion of the Paper a vote of thanks to Mr. PYCRAFT, proposed by the Chairman and seconded by the Vice-Chairman, was carried unanimously.

Owing to the lateness of the hour, another Paper, by the Secretary, which was to have been read at this meeting, was postponed until February 16th.

At the conclusion of the ordinary business a meeting of the newly-elected Sub-Committee was held, at which a provisional list of publications, drawn up by the Secretary, was considered, with the result that the following magazines were selected, viz.: "Nature" and the "Entomologists' Monthly Magazine." The Vice-Chairman proposed the "Ibis," which was accordingly included in the list, further selections in other departments being postponed.

February 16th.—Mr. MONTAGU BROWNE (Vice-Chairman) presiding. The Sub-Committee reported that the following Magazines had been selected for circulation, in addition to those decided upon at the last meeting, viz., "The Quarterly Journal of Microscopical Science," "The Geological Magazine," "The Conchological Journal," "The Conchologist," and "The Microscope."

Messrs. F. BOUSKELL and C. B. HEADLEY brought forward a preliminary list of nearly 450 Leicestershire Macro Lepidoptera—a valuable

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contribution to the invertebrate fauna of the county (printed at page 311) The paper was profusely illustrated by examples of the rarer species—several of them being of great interest.

A vote of thanks to the joint authors, proposed by the Rev. R. W. LANCASTER, and seconded by Miss PAYNE, was carried unanimously.

The SECRETARY then read a Paper on "A Sea Pen *(Pennatula)*" in which he described the facts connected with both the horizontal and vertical distribution of these interesting forms in the ocean. It was shown how greatly the explorations of the "Challenger" expedition had added to previous knowledge of the habits and life-histories of the Pennatulida, which had always been regarded as essentially shallow water-forms, until the occurrence of examples at various depths, so great in one case—that of *Umbellula leptocaulis*—as 2,440 fathoms, quite altered the received opinion on this point. Before describing the structure of *Pennatula* in some detail, attention was called to its position in the class Actinozoa, and consequent affinities to the Sea Anemones and coral-forming polypes, and also to the position assumed by the colony when living at the ocean bottom—a point on which much diversity of opinion had obtained. The latter half of the paper, which dealt with questions of anatomy and development, was illustrated by blackboard sketches, a fine specimen of *Pennatula*, recently presented to the Museum, and numerous micro slides, prepared by the lecturer from material kindly furnished by Professor W. C. MCINTOSH, of S. Andrew's University. Drs. BOND and POPE, and Messrs. G. WARD and W. H. LLOYD kindly lent microscopes for the evening.

At the conclusion of the Paper a vote of thanks, proposed by the Vice-Chairman, was carried unanimously.

F. M. POPE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. WILLIAM SIMPSON, 1, Brighton Villas.
Secretary—Mr. W. JNO. SCAMPTON, 1, Pelham Street.
[This Section does not meet in the Summer months.]

WILLIAM SIMPSON, *Chairman.*

SECTION "D."

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston, Leicester.
Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Highfields, Leicester.
EVENING MEETINGS—The third Wednesday in each month, at 7 p.m., at the Museum.
FIELD DAYS—The second Wednesday in each Summer month, at about 3 p.m.

1891.

April 8.—Excursion (rail) to Kirby Muxloe.
,, 15.—Evening Meeting:—
1. Exhibition of specimens.
2. Paper by Messrs. HEADLY and BOUSKELL on "The Lepidoptera of Leicestershire."
3. Discussion of work of Home Reading Circle.

May 13.—Excursion (rail) to Sileby. Tea at Birstall Hill.
,, 20.—Evening Meeting:—
1. Exhibition of specimens.
2. Paper by Mr. F. T. MOTT on "Chlorophyll."
3. Discussion of work of Home Reading Circle.

June 10.—Excursion to Croxton Park.
,, 17.—Evening Meeting.
1. Exhibition of specimens.
2. Paper.
3. Discussion of work of Home Reading Circle.

T. A. PRESTON, *Chairman.*

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SECTION "E."

Chairman—Dr. F. M. Pope, Campbell House.

Vice-Chairman—Montagu Browne, F.Z.S., F.G.S., Town Museum.

Secretary—F. R. Rowley, Town Museum.

EVENING MEETINGS.

1891.

April 13.—Paper by Mr. J. G. Parr, M.R.C.V.S., "Some Internal Parasites of the Domestic Animals." (Illustrated.)

May 11.—Election of Officers. Paper by Mr. W. A. Evans, "Notes on the Fauna of the North West Territory." (Illustrated).

June 8.—Notes and Exhibits.

F. M. POPE *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

VOL. ~~III.~~ II

PART VIII., JULY, 1891.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 22ND, 1891.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
1891.

[*Price Sixpence.*]

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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

At the FIFTY-SIXTH ANNUAL GENERAL MEETING, held in the Lecture Hall, Town Museum, on Monday Evening, the 22nd day of June, 1891, at 7 p.m.

F. T. MOTT, Esq., F.R.G.S., Retiring President, in the Chair.

The CORRESPONDING SECRETARY presented the Annual Report of the Council, and the Financial Statement, as audited, which were taken as read.

Moved by Mr. J. D. PAUL, F.G.S., seconded by Mr. T. CARTER, LL.B. :—

(1.) "That the Annual Report and Financial Statement be adopted and printed for circulation."

Carried.

The CHAIRMAN, after a few remarks, vacated the chair in favour of R. HARVEY, Esq., LL.B., the New President, who addressed the meeting.

The PRESIDENT announced that as only a sufficient number of persons had been nominated to fill the several offices, no voting for any of the officers was required.

The PRESIDENT, therefore, declared all the gentlemen nominated duly elected, namely :—

Vice-Presidents :—

E. F. COOPER, F.L.S.	J. D. PAUL, F.G.S.
F. T. MOTT, F.R.G.S.	GEORGE STEVENSON.

Treasurer :—

ALFRED PAGET.

Council :—

C. J. BILLSON, M.A.	C. A. MOORE, M. D.
H. BILLSON.	A. H. PAGET.
A. T. DRAPER.	JAMES PLANT, F.G.S.
J. E. M. FINCH, M.D.	H. TOMKINS, M.D.
G. B. FRANKLIN.	W. P. VICCARS.
A. P. MOORE, M.A.	W. A. VICE, M.B.

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Honorary Secretaries:–

CORRESPONDING SECRETARY	J. M. GIMSON.
MINUTE SECRETARY	WILLIAM SIMPSON.
FINANCIAL SECRETARY	GEORGE HULL.

Moved by Mr. R. HARVEY, LL.B., seconded by Mr. W. SIMPSON :—

(2.) "That this Society accepts with regret the resignation of Mr. C. J. BILLSON, M.A., as Corresponding Secretary, and desires to convey to him their high appreciation of his services to the Society during the seven years that he has so ably filled that office."

Carried.

Moved by Mr. F. T. MOTT, F.R.G.S., seconded by Mr. T. CARTER, LL.B. :—

(3.) "That the thanks of the Society be given to the Hon. Secretaries and other officers of the Society for their services during the past year; to the representatives and proprietors of the Local Press for their reports of the Society's proceedings; and to the Curator for his services to the Museum."

Carried.

Moved by Mr. C. J. BILLSON, M.A., seconded by Mr. G. HULL :—

(4.) "That Mr. E. CLEPHAN and Mr. T. C. LEE be elected Auditors for the ensuing year."

Carried.

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CHLOROPHYLL.

By F. T. Mott, F.R.G.S. (Read before Section "D.")

The great fundamental Science of Chemistry is generally divided into two branches, distinguished as Inorganic and Organic Chemistry. It seems doubtful whether these ought not to be regarded as two quite independent Sciences.

The laws which govern the actions of the simple inorganic elements in their relations to each other have been fairly well worked out. But these laws are, in many respects, inapplicable to living matter.

It may be that in protoplasm and all its products there is nothing but the inorganic elements associated in highly complex proportions, but this is not quite certain. It is possible that there yet remains to be discovered an additional element to which the phenomena of life are primarily due.

It is well known that acids which would have an immediate action upon the inorganic elements supposed to constitute flesh, are powerless to affect that flesh while in a living state.

The chemist may construct in his laboratory such substances as starch and sugar, albumen and caseine, and may perhaps produce food without the assistance of animal or vegetable life, but there seems at present no possibility of the artificial construction of living protoplasm, no means whatever of generating life from the known inorganic elements. Whether the difference between the living and the not living lies in a yet undiscovered element, or in a more concentrated condition of energy, or in some other principle of which we have at present no conception, that difference is a very wide one, and seems to me of such importance as to justify perhaps the establishment of Bio-Chemistry as a distinct Science. This Science divides itself naturally into two branches—viz., the Chemistry of Animal and of Vegetable Life, the former depending almost entirely upon the previous existence of the latter.

The distinguishing feature of vegetable life is its power of self-increase by the assimilation of inorganic elements. These elements it takes up into its own living substance, increasing the bulk of that living substance, and secreting from it a number of organic but not actually *living* substances, from which animal life is ultimately sustained. One of these secreted and not actually living substances, called *Cellulose*, is absolutely essential to nearly all vegetable life. It forms the inclosing membrane of every cell, and constitutes the supporting framework of every plant, whether as skin, fibre, or wood. The other secretions, starch, sugar, resin, gum, &c., are more or less important to the plant,

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and still more important to animals, but are not so absolutely essential in the vegetable economy as cellulose.

These secretions have one character in common—they all contain large quantities of carbon and hydrogen, and it has been the problem of Botany to discover from what sources and by what processes the necessary carbon and hydrogen are obtained and combined—a problem which is not even yet completely solved. This much, however, may be taken as proved, that the carbon comes from the atmosphere, and the hydrogen from water, generally absorbed by the roots. It is further proved that the carbon is obtained from the carbon-dioxide which exists as a gas in the atmosphere, and that the agents by which it is extracted and solidified are those remarkable granules of protoplasm which are coloured green by the presence of Chlorophyll. This green colouring matter has never been entirely isolated from the other vegetable matter with which it is associated, and its actual composition is not fully known. Botanists even differ as to the meaning which they attach to the word. Sometimes the protoplasmic granules themselves are called Chlorophyll, sometimes the colouring matter only.

The most recent researches into the nature of Chlorophyll seem to show that it consists of two substances, called *Phylloxanthin* and *Phyllocyanin*. The *Phylloxanthin* absorbs only the short violet waves of white light reflecting the red and the green waves, and has therefore a yellow colour. The *Phyllocyanin* absorbs only the long red waves reflecting the green and violet, and has therefore a blue colour. The waves reflected from the two together combine into white light with a surplus of green, hence the green appearance of the mixed Chlorophyll.

Plants with green leaves kept in the dark have no power to extract carbon from the atmosphere, but as soon as light falls upon the green granules, their power of decomposing carbon-dioxide is immediately set up. What is the meaning of this? What is the history of the process? I do not think that it has ever been experimentally determined, but a possible explanation is suggested by the following considerations:—

1. Chemical affinity is one of the forms of that universal force known as "attraction," and it is by this form of attraction that every atom of carbon in the carbon-dioxide holds in close union with it two atoms of oxygen.

2. The force of chemical attraction in many substances is known to vary with the temperature. Place metallic sodium or potassium upon cold water, and the attraction between the metal and the oxygen is slow. Place them upon warm water and it is much more rapid. The heating of the water is an imparting of energy to it. Probably some of that energy, being taken up by the oxygen atoms, goes to intensify their chemical attraction for the metal.

3. When light falls upon Chlorophyll, energy is imparted to it, probably intensifying its affinity for carbon and enabling it to tear away the carbon from the oxygen with which it is united.

4. But carbon alone will not enable a plant to grow. Hydrogen

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must be provided also, and a small proportion of oxygen. Now, if the addition of the light-energy enables one of the constituents of Chlorophyll to extract carbon from the atmosphere, while its effect upon the other constituent is to intensify its attraction for hydrogen which it is thus able to extract from the water, a scientific reason is shown for the compound nature of Chlorophyll. The carbon, hydrogen, and oxygen being thus brought into intimate relation to each other within the very molecules of the Chlorophyll, may naturally re-unite as cellulose and exude from the protoplasm in that form.

Cellulose is sometimes said to consist of carbon and the elements of water, its formula being $C_6 H_{10} O_5$ which represents six atoms of carbon and five of water; and it might be supposed that the water combines directly with the carbon and does not require to be decomposed. This is not likely to be the case, however. Water and carbon have no direct affinity, and in some of the other carbo-hydrates allied to cellulose, the hydrogen is in larger proportion to the oxygen. It is almost certain that the hydrogen is extracted from the water, and that the three elements re-combine within the Chlorophyll grains. In these processes there is, of course, a large evolution of oxygen, especially from the decomposition of the carbon-dioxide. But plants do not part with the whole of the oxygen they set free. It is a necessary constituent of protoplasm, as well as of cellulose and it is believed that in decomposing the carbon-dioxide, only one of the atoms of oxygen is liberated, while the other is retained.

The growth of the plant requires not only cellulose for the cell-walls, but a constant manufacture of more protoplasm to fill the new cells. Therefore, while some of the carbon, hydrogen, and oxygen, extracted from the air and water, unite to form cellulose, other portions, with a small percentage of nitrogen, which comes up from the soil dissolved in the water, unite together to form the food of the protoplasm which imparts to them its own mysterious character of life. Starch and sugar are soluble forms of cellulose, and are largely produced as reserve material which can be easily moved in solution and converted into cellulose as required.

Chlorophyll has never been obtained in an absolutely pure state. The solutions of it which are used for experimenting are generally obtained in the following manner:—A quantity of green leaves (the leaves of grass are particularly recommended) are soaked for some time in alcohol which dissolves the Chlorophyll and some other portions of the leaves as well. The liquid being poured off, is mixed with twice its volume of water, and becomes milky in appearance. Ether is then added to it, and the vessel is kept agitated for a short time. The ether dissolves out the Chlorophyll and floats with it on the surface, whence it is collected. This is found to be as pure an extract of Chlorophyll as can well be got, but it is known not to be entirely pure. Chlorophyll is an unstable compound, and extracts of it rapidly change if exposed to the light and air. It is destroyed also by the presence of acids, and the reason for putting soda into the water in which green vegetables are

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boiled is that it neutralizes any acids contained in their tissues, which would otherwise destroy the Chlorophyll and give a dirty colour to the vegetables.

It has been supposed that the action of some free acid upon the Chlorophyll in autumn may be the cause of the changed colour of the leaves. But the fact that chemical extracts of Chlorophyll are easily changed by acids does not prove that living Chlorophyll would be affected in the same manner. I have allowed two inches of the point of a leaf of a living Aspidistra to lie in a cup of vinegar for half an hour, and not the least change in colour has taken place.

Living protaplasm cannot be stained for microscopic examination, but when the life is gone it takes the stain quite easily.

The autumn colours appear to indicate that the proportion of *Phyllocyanin* has diminished, while that of *Phylloxanthin* has increased; and this means that, while, during the summer, the Chlorophyll was taking in energy from both the red and the violet vibrations in the sunlight, the absorption of the large red vibrations has diminished, the Chlorophyll having assumed a more uniform molecular condition adapted to the absorption of the small waves only. The violet vibrations being thus eliminated from the white light, the green and red reflected together produce the brilliant yellows and scarlets of the autumn foliage.

Since it is in the autumn that the chief deposit of reserve material takes place in fruits, seeds, and tubers, while in the summer there is a larger demand for protoplasm to occupy the cells of growing parts; and since the reserve materials require the larger proportion of hydrogen, while the protoplasm needs an excess of carbon, it may possibly be inferred that it is the *Phyllocyanin* which is the producer of carbon from the atmosphere, and which diminishes in quantity as the demand for carbon falls off.

But with our present imperfect knowledge of Bio-Chemistry it is impossible to follow accurately the complex actions and reactions which take place in the living tissues. All the very varied materials and organs of living creatures seem to be built up of only a few of the simple elements—the three gases, oxygen, hydrogen, and nitrogen; three non-metallic solids, carbon, sulphur, and phosphorus; and four metals, iron, calcium, sodium, and potassium—but these, under the influence of life, combine together in the most extraordinary proportions—such proportions as are unknown in Inorganic Chemistry.

Living protoplasm seems to have these elements under its absolute control, to do as it will with them—to unite them in all conceivable proportions, and so to produce the infinite variety of result which is one of the most striking characteristics of the organic world; and the responsible head of its chemical laboratory is the Chlorophyll-bearing granule, a chemist of surpassing skill and power, without whose aid man himself could not have come into existence, nor could maintain himself for a single year in the atmosphere which he so rapidly vitiates.

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A FEW NOTES ON THE DISTRIBUTION AND VARIATION OF THE LEICESTERSHIRE MACRO-LEPIDOPTERA.

By Messrs. F. Bouskell and C. B. Headly. (Read before Section "D.")

First, as to the distribution. There are about 450 distinct species of Macro-Lepidoptera recorded for this county which is quite an average list for the Midlands.

We are not so rich in the Diurni or Butterflies as some of our neighbours, but some very good things have occurred, though, as a rule, not in any quantity; and in the Moths we have quite a representative list.

Out of the 66 British Diurni, or Butterflies, we have 37. Some of the principal ones are Leucophasia Sinapis, The Wood White, which is rather a rare insect, and was taken at Earl Shilton some years ago. There is only one record of this insect for Nottinghamshire, and none at present for Derbyshire. Colias Edusa, The Clouded Yellow, and its beautiful pale variety, Helice, occurred in some numbers in 1877 in the Ansty Lane, and occasionally specimens were found all over the county, but since that date only odd ones have turned up, the last record being from Knighton in 1885. According to Stainton, this insect is common in some years in the South of England, but occurs comparatively seldom in the Midland Counties, although in exceptional seasons it has occurred in Yorkshire and Westmoreland. It is one of those insects which are most uncertain in their appearance, occurring in numbers one year, and then for several years almost disappearing. Argynnis Paphia, The Silver-Washed Fritillary, has been taken in several places, but is by no means common. (We shall have a few words to say about this insect when we come to the variation.) The same remark applies to A. Euphrosyne, The Pearl-Bordered Fritillary, and A. Selene, the Small Pearl-Bordered. Of the family Vanessidæ, which numbers seven, all are represented. V.C. Album, The Comma, has occurred several times near Market Harborough and Loughborough; and that rarity V. Antiopa, The Camberwell Beauty, has occurred no less than five times, twice in 1873, when it was taken by Mr. F. Bates and Mr. T. Walker; also at Loughborough by Mr. J. Wieldt; at Bitteswell by Mr. W. T. P. Winter; and in the Borough of Leicester, on the Railway Embankment, by Mr. J. R. Weatherhead. This insect is one of our rarest Butterflies, though it is by no means rare on the Continent, and exceedingly common in North America. Apatura Iris, The Purple Emperor, The King of Butterflies, is so called from its regal colouring and lofty ideas of flight, but it is by no means a royal feeder, as, in common with some of the Coleoptera, it has a taste for dead rabbits and such-like dainties. Stainton records this insect, and we have no other note, but most likely it has

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occurred at Bradgate amongst the fine old oaks there. The next insect is Arge Galathea, The Marbled White, which is recorded by the Rev. A. Matthews, near Harborough. As this is a chalk insect, and very local, though occurring in great numbers where it is found, it was probably blown out of its district, or was accidentally imported in the pupa state. It is plentiful in Northamptonshire and in Nottinghamshire, near Worksop and Mansfield. Thecla Quercus, The Purple Hair Streak, and T. W. Album, The White Letter Hair Streak, have also been taken.

Out of the 115 Nocturni we have 57. The first family is the Sphingidæ, which numbers 16, of which 13 have been taken in the county. The most remarkable are Acherontia Atropos, The Death's Head Hawk, well known to the superstitious. This insect has occurred in many places in the county, and is noted for its love of honey (through which we got most of our notes), and also for its power of uttering a distinct cry or sound in all its stages of larva pupa and imago. Up to the present time it is not known how this cry is produced, but there are several theories as to its production, none of which have been generally accepted ; but the theory that it is produced by the proboscis or trunk rubbing against the palpi or feelers seems to be the most probable, as when the palpi are separated the sound ceases, and if one palpi is cut off it is almost inaudible. Sphinx Convolvuli, The Convolvulus Hawk, has been taken at several places in the county; it is remarkable for its very swift flight. Deilephila Galii, The Bedstraw Hawk, derives its specific name from the food-plant of the larva, the Galium Verum. It has occurred at Loughborough and Harborough. Chœrocampa Celerio, The Silver-Striped Hawk, was taken in 1885. It has only occurred several times in England, and may be regarded as one of our rarest records. Sesia Cynipiformis, The Yellow-Legged Clear Wing, which is a rare and local insect, is found on the oak. Up to the present the only place in the county at which it has occurred is Bradgate Park. S. Bembiciformis, The Hornet Clear Wing, has occurred in some of our osier beds. Its resemblance to the Hornet accounts for its popular name. Zygæna Filipendulæ, The Six-Spotted Burnet, although a very common insect in some counties, has only been found (some years ago) at Aylestone, Loughborough, and Harborough. We have searched for it in many places during the last four years, but have failed to find even a single specimen, while in Gloucestershire and the Southern counties you see the fields covered with its pretty white cocoons, so we question whether it is not altogether extinct in the county, but can form no idea as to the cause of its disappearance. It is certainly not the scarcity of its food-plant, Lotus Corniculatus, which is so exceedingly common. Cossus Ligniperda, The Goat Moth, occurs only too commonly in many of our trees, in the larva state, where it does great damage by boring galleries, and as the larva state lasts for several years they have time to cause some little havoc. We have found oak, ash, elm, willow, poplar, lilac, apple, and plum trees infested by it. The extraordinary cocoon

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and pupa-case exhibited were obtained from a willow-tree some years ago, and yet the goat smell is quite distinguishable now. The spines on each segment of the pupa enable it to propel itself from the interior of its tree to the outside opening of the gallery in order that the imago may emerge. The muscular power of the larva is something enormous, as will be seen from the illustration exhibited. As to the strength of the imago, some years ago we reared one from a larva which was three years before it came to the perfect state. It was kept in a tin box, and duly turned to a pupa. One evening we were startled by hearing a loud tapping noise. We looked all round the room and thought a bird had got in, but as we could find nothing, at last we looked in the box, and there was Mr. Goat in a pretty lively state. A large dose of chloroform was the first drink he tasted, as he was a little too big for the killing bottle. He seemed to go off all right and seemed quite dead. He was duly pinned to the setting-board and braced down with four large braces and nine pins and left. In about two hours we went to look at him and to do so lighted the gas, and the first thing which happened was a spluttering, as Mr. Goat, not content with the chloroform, wanted to take gas, for having revived and lifted all the nine pins out of the setting-board, he flew at the gas and got singed, so we left him in chloroform all night, and the singed specimen exhibited is the result of three years' weary waiting. Lithosia Quadra, The Four-Spotted Footman, a rather rare insect, has occurred at Gumley. The next insect is Trichiura Cratægi, The Pale Oak Eggar, which in the autumn is found at the lamps of "Darkest Knighton." We are afraid that now this famous hunting-ground is going to be included in the borough, and the lamps increased, their present attractiveness will disappear owing to superabundance of light, but perhaps this will be compensated for by the late insects being caught. Lasiocampa Quercifolia, The Lappet, has occurred twice in the county. It is somewhat remarkable for its resemblance, when at rest, to a dead oak-leaf. Newman illustrates this at page 46 of his "British Moths." That pretty insect, Saturnia Carpini The Emperor has also occurred.

Out of the 275 Geometræ, or Loopers, so called from the peculiar attitude the Caterpillars assume in walking, we have 141. Some of the rarest are Angerona Prunaria, The Orange, from near Loughborough. Pericallia Syringaria, The Lilac Beauty, from the lamps at Knighton. Ennomos Alniaria, The Large Thorn, which is generally considered a coast insect, and until the last few years was deemed a great rarity Nyssia Hispidaria, The Small Bridled Beauty, from Loughborough. This Moth is peculiar for its wingless female, and is rather local. Tephrosia Crepuscularia, The Small Engrailed, is rather local, and has occurred at Bardon Hill, Loughborough, and Harborough. Geometra Papilionaria, The Large Emerald, is peculiar for its beautiful green shade when first caught, which we are sorry to say soon fades. Eupisteria Heparata, The Dingy Shell, which as a rule does not occur so far north, is exceedingly local. Lobophora Viretata, The

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Yellow-Barred Brindle, is rather rare, and has occurred near Harborough. Scotosia Certata, The Scarce Tissue, has occurred near Loughborough. It is rare, and as a rule does not occur so far north. Anaitis Plagiata, The Treble Bar, has been found at Knighton. This is not uncommon in other counties but has only occurred here twice.

We have 17 Cuspidates out of 32. The most remarkable are Dicranura Bifida, The Poplar Kitten, which is very rare in the county; Notodonta Cucullina, The Maple Prominent, from Knighton; N. Dictea, The Swallow Prominent, from Loughborough and Harborough; N. Chaonia, The Lunar Marbled Brown, which is considered a rare insect in England, and has been taken at Loughborough.

Of the largest class, the Noctuas, we have 182 out of 310. The following are the rarest:—Acronycta Leporina, The Miller. This is an exceedingly rare insect, and has only occurred near Tonge in the county. Leucania Turca, The Double Line, is a Southern insect, but has occurred once in the county. Luperina Cespitis, The Hedge Rustic, has occurred in a few of our English counties and once in Leicestershire—at Knighton. Agrotis Valligera, The Archer's Dart. This is essentially a coast Moth, but there is one record for the county. A. Pyrophila, The Dotted Rustic. This Moth is very rare and local, and has occurred only once in the county. Of the Triphænae, or Yellow Underwings, all the six species occur. Noctua Rhomboidea, The Square Spotted Clay, which occurs principally in the Southern Counties, has been taken here. Tæniocampa Miniosa, The Blossom Underwing, occurs occasionally in various counties, and has been taken at Loughborough. It is by no means common. Dasycampa Rubiginea, The Dotted Chestnut. This is an exceedingly rare Moth. It has occurred occasionally on the South Coast. We have one record from Loughborough. Cosmia Pyralina, The Lunar-Spotted Pinion, has occurred once at Stretton Magna. Aplecta Tincta, The Silvery Arches, has occurred twice. It is by no means common. Hadena Rectilinea, The Saxon. This Moth is usually caught in Yorkshire and Scotland. There is one note for the county. Cucullia Scrophulariæ, The Water Betony. This Moth has occurred near Harborough. It is generally confined to the Southern and Western Counties. Catocala Nupta, The Crimson Underwing, has also occurred in the county.

It will be seen that, out of a total of 788 Macros found in the British Isles, we have about 450 occurring in the county, but of course fresh species may be found and this number increased. Many of the insects mentioned have not hitherto been known to occur so far north, and conversely others so far south, and others have been supposed to occur only on the sea coast, but how the coast insects got so far inland we cannot tell with any certainty. They may have been blown inland, as it is a known fact that insects are often found many miles out at sea. They may have been imported in the larva or pupa state with plants or soil, or they may actually be indigenous to the county. We are rather in favour of the importation theory in several cases, but in others, where the larva occur, we are inclined to think they are indigenous, but of course they

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might have been imported and become naturalised, so that each case should be considered on its merits, and no particular rule can be laid down, whether a species is indigenous to the county or not.

A few words as to the variation. Many northern forms differ from the southern, and ours are often intermediate between the two. This is strikingly illustrated in Xylophasia Polyodon, The Dark Arches, the northern form being black, the southern light drab (and often so light as to be taken for X. Lithoxylea, The Light Arches), and ours rather darker, or between the two. This dark variation is technically known as melanism, and occurs in many species. Perhaps a better form of it is shown in Argynnis Paphia, The Silver-Washed Fritillary, and its dark variety, Valezina. The ordinary form exhibited is bright sienna brown, while the variety is dark olive green, and confined to the South of England, principally to the New Forest and Devonshire. A rather different form is shown in A. Betularia, The Pepper Moth, and the variety, Doubledayaria. The former is speckled black and white, and the latter quite black, but this form is not confined to the north or south, but occurs in many places, the specimen exhibited being a local one.

It is unfortunate that at present there is no theory which has thoroughly explained the cause of melanism, but when you see in one insect the northern form dark and the southern light, as in Polyodon; and in another the southern form dark and light forms occurring with it in the same place as in Valizina, and then as in Betularia both light and dark forms occurring, both north and south, it does seem rather difficult to get an explanation. The best theory as to the cause of melanism seems to be Mr. Tutt's—"That it is caused by humidity, and not by the difference in temperature or altitude alone, but by excess of moisture combined with natural selection." Mr. Tutt instances the exceedingly wet summer of 1888 in support of his theory, when numbers of dark forms occurred, the light forms being exceedingly rare. We noticed in that year that X. Polyodon was decidedly darker than in other years. Mr. Tutt also, in "The Entomologists' Record," vol. i., No. 5, p. 122, instances a black variety of Polyodon in the wet season of 1872, from Sheerness, but it is rather the exception to get the dark varieties so far south. This seems almost conclusive to us as to the effect of the excess of moisture, and the deduction may fairly be made that melanism, in many cases, is undoubtedly caused by excess of moisture, but until some further light has been thrown on the subject, we will not go so far as to say that humidity is the cause in every case.

Some species are double-brooded, as Selenia Illunaria, The Early Thorn, the one brood appearing in April and the other in July. These two broods are entirely distinct, the July brood being half the size of the April brood, and the marking and colour rather different. At one time they were thought distinct species, but it is proved now that they are the same. Perhaps the difference in the temperature and the humidity in April and July is the cause of this variation, which occurs also in Lunaria and Illustraria. Many forms of ordinary variation might

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be mentioned, but we have only room for a few local examples. The first is Lomaspilis Marginata, The Clouded Border, of which the black markings are exceedingly variable. Four very good varieties are shown in Newman, p. 101, and we also exhibit four local specimens. Emmelesia Albulata, The Grass Rivulet is also very variable; we exhibit four different types. Then we come to Ypsetes Elutata, The July Highflyer, five varieties of which are given by Newman, p. 153. The four local specimens are rather interesting. Hybernia Defoliaria, The Mottled Umber, is also given to variation. Cidaria Russata, The Common Marbled Carpet Newman, p. 185, is also exceedingly variable, and Cidaria Immanata runs very close to the last insect in some of its forms. Miana Strigilis, The Marbled Minor Newman, p. 307, has some very pretty varieties. Tæniocampa Instabilis (or Incerta), The Clouded Drab. The Latin name of this insect sufficiently indicates its character. The five local varieties are rather curious, and Newman also gives some good varieties p. 358. Perhaps the most variable insect exhibited is Tryphæna Pronuba, The Large Yellow Underwing. The 12 local forms are rather interesting in their extreme variation, ranging from the lightest shades of brown to almost black.

In conclusion we must apologise for the dryness of the Paper, and for not going into the subject as deeply as we had wished, not having had time to work it out thoroughly, but we hope to do so on some future occasion.

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NOTES ON SOME MALFORMATIONS OF THE BILL IN BIRDS.

By W. P. Pycraft, Assistant, Zoological Department, Town Museum.
(Read before Section "E.")

Some time ago I was requested to furnish, within the compass of a short Paper, a description of some of the most remarkable and interesting malformations of birds' bills, for the criticism of the members of Section "E," and the following represents the results of my endeavours.

It struck me that it would be advisable—nay, even necessary—to preface my remarks by a short and advisedly popular account of the structure of a bird's bill, and of its familiar horny covering; comparing this latter with the apparently widely different, but really exactly similar (histologically) epidermal formations of other animals.

Let us commence at once with a few words on the terminology of the bill. This is happily neither bulky nor complicated, but one is apt to get just a little puzzled at times, owing to the loose way in which the various terms in use are employed. Of these perhaps the "bill" is the most familiar of all, and needs but little comment. It may be applied to the jaws either with or without their coverings. The "beak" is another very common name; it may, and generally does, include both the upper and lower jaws, but "upper beak" is a term constantly met with. A somewhat strained use of this name is when it is made to do duty for the osseous skeleton as well as its horny sheaths, when perfectly distinct from one another. Such a confusion of terms occurs, for instance, in that otherwise admirable and popular work, "Cassell's Natural History."* Here, in describing the anatomy of the skull, certain bones are stated to be "connected . . . with the bones which go to form the *beak*"†; whilst, a little further on, the "beak" is described as "the horny covering of the jaws." Often the upper and lower jaws are spoken of as upper and lower mandibles, and although there is no special reason why this form of description should not be used—in fact it is quite defensible—yet I would advocate, and be glad to see it by common consent expunged, the term mandible being reserved for the lower jaw, as it is in anatomical works. Still more objectionable terms, to my mind, are the "maxilla" and the "mandibula," the former being used for the upper jaw, and the latter for the lower. Now, the maxilla proper, in birds, is generally a more or less slender rod-like bone which takes little or no part in the formation of the bill. Thus

* "Cassell's Natural History," vol. iii., pp. 241–247.

† Italics are mine.

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the inadvisability of including the whole of the upper jaw under this name must be patent to every one. The "mandibula" is, I think, well replaced by "mandible." So much for this part of the subject; now for the anatomical side.

I spoke just now of the exterior of the beak. Later, my remarks will be confined entirely to this region; just now I must say something of its structure. The word *horny* expresses it exactly; but its texture, or rather its density, varies considerably. Histologically, it is a product of the epidermis, and therefore it agrees precisely in its mode of origin with the hairs, bristles, scales, nails, hoofs, and horns of other animals; as well as the leg-scales, spurs, claws, and feathers, which result from the epidermal activity of the various parts of the bird's body.

The accompanying diagrams in fig. 1 are intended to represent longitudinal and transverse sections through a typical bird's bill, such as would be capable of attacking hard substances. **A**, is the longitudinal, **B**, the transverse section. The shaded portion represents osseous or bony tissue, the "framework" just mentioned; the dotted, sagittate exterior, the "horny" matter, which it would be well to take particular notice of. The *Scolopacidæ*, a family of the Wading Birds, furnish us with a very different kind of bill. If we were to examine the beak of a freshly-killed bird—say that of a Snipe—we should find that it was very flexible throughout, somewhat swollen at the tip, and covered with a very thin skin. Further examination would show that this swollen tip was well supplied with nerves, thus converting the beak into a highly sensitive tactile organ. Such a bill is used for probing into soft ground in search of food, in the shape of worms, &c., which are detected and seized immediately they come into contact with the sensitive tip. It would be well to compare the diagrammatic section of this bill (fig. 2) with that of fig. 1, bearing in mind at the same time the uses to which each is put.

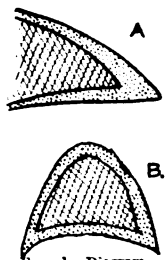

Fig. 1.—Diagrammatic section through the upper half of a "hard" bill.

Fig. 2.—Diagrammatic section through the upper half of a bill of a wader.

Supposing we were to soak such a bill as that shown in fig. 1 in hot water for a short time, we should find that the horny exterior could be easily drawn off the bony core beneath, and that it would still perfectly preserve its form. This, then, is the sheath or *Rhamphotheca*, a very terrible name, to be sure; if we dissect it we shall find that it is derived from two Greek words—*ῥάμφος*, a bill, and *θήκη*, a case, or sheath.

The osseous framework enclosed by the Rhamphotheca will need only to be very briefly discussed, since it bears but slightly upon the present Paper. Suffice it to say, it embraces a part of the facial portion of the skull, the principal bones taking part in its formation being the premaxillæ; these are large tri-radiate bones, coalescing at the apex of the beak, and each sending three long processes backwards, one to take part in forming the "ridge" of the bill, one the side, corresponding to

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the cutting edge, and one to form a longitudinal bar in the middle line of the bill and helping to form the roof of the mouth.*

And now, as I trust this has become thoroughly assimilated, let us try to see, as far as is possible, how and why these parts become malformed. First of all—what is malformation? The dictionary says: "irregular or anomalous formation of structure of parts"—surely a very good definition. Next—what is the most common form of malformation? I propose to divide the few instances I have selected to illustrate this Paper into three forms.

Common	*a*	Malformation resulting from overgrowth of the horny sheath.
	b	Malformation arising from injury to the same.
Less Common	*c*	Malformation due to embryonic disturbance.

The first two forms of malformation are by far the commonest, and the causes producing each particular case are generally not difficult to trace. Let us discuss those cases of malformation resulting from overgrowth, first. You will recollect that a little while ago I compared the sheath of a bird's bill to such apparently diverse structures as the hairs, nails, horns, &c., of other animals, as well as with its own leg-scales, claws, spurs, and feathers. Well then, I need hardly remind you—for you are of course perfectly familiar with the characteristics of such "common objects"—that those structures which are subjected to continual wear are compelled as continually to supply such loss by a corresponding amount of new material. This supply is maintained by the activity of the horn-secreting cells at the base of the bill, new matter being ever pushed forward from behind to replace that which is lost. Indeed, so obedient are the cells set apart for the production, or secretion, of each peculiar structure, that they will continue to supply new material even when there has been little or no loss. To make this perfectly clear, let us glance at a few dermal armaments selected at random from higher animals. In the case of our own species, it has been stated that in old, bed-ridden people, the toe nails often increase to an abnormal length, some of them becoming two or three inches long, thick, and twisted like a ram's horn.†

In cases where animals possessing hoofs are by reason of their environment, prevented from keeping in check the natural growth of these parts—as, for instance, Oxen and Sheep, which pass their lives upon soft, yielding ground (whether it be in the pasture or the "yard"), instead of hard roads—we find, very often, that each hoof has grown inwards, and frequently upwards, for a considerable length. I once saw a Zebra in a menagerie, which had been so long confined in a close cage, that the hoofs had grown upwards, and somewhat spirally, until they had assumed more than double their normal volume. Cage birds often have abnormally

* These bones can be very easily seen in a Chicken's skull.

† Bland Sutton: "Evolution and Disease," p. 20.

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long claws; indeed they frequently increase so much as to render it a difficult matter for the bird to leave or regain its perch, owing to their clinging around it.

I hope I have now sufficiently explained and illustrated what is meant by malformation as the result of overgrowth, as well as made clear the peculiar properties of constantly-growing horny tissue, so that you will be enabled to realize the conditions under which the normal length of a bill may be retained or lost. The following instances illustrate what has been said.

I have no doubt that you are all more or less familiar with that pretty little autumn visitant to these shores—the Mealy Redpoll, *Linota linaria* (Linn.); if so, you may also be aware that there was a time when it was believed that there existed two races or even species of this bird, the one constituting the *Linota linaria* of Linnæus, the other the *Linaria holbœlli* of Brehm. Now the reason for this was based solely upon the difference in size of the bill, which difference was invariably met with in the examination of a number of birds; the smaller-billed birds referred to formed the Linnæan type, whilst the larger-billed were considered to be distinct, and were distinguished by the specific name of *holbœlli*. Continued and systematic observation soon showed that the two forms were really one. This discovery is due to Wolley, who turned his attention to the matter during his residence in Lapland, which extended over five summers and two winters. He found that although the difference was more apparent than real, and depended upon the time of the year in which the specimen was procured, yet there was a very decided distinction in the size of the bill between birds killed at the end of the winter, and those killed in the autumn. In the former case the bills were shorter and less in circumference, owing to the hard seeds, upon which the birds then solely depended for food, wearing down the tips and edges of the bill sheaths; whilst during the summer, when insects formed the staple diet, the bill increased, not only in length but along its edges. Another instance of variation in size, although due to different causes, is that of the Puffin, *Fratercula arctica* (Linn.). Here the bill is larger in winter than in summer. Dr. Louis Bureau established the fact that "our Puffin sheds portions of its bill and the palpebral ornaments in autumn, the horny frontal sheath scaling off in pieces like plates of armour, and being accompanied by atrophy and loss of colour."*

This waxing and waning of the bill is a lesson that might be taken to heart by those systematic ornithologists who, in their anxiety to differentiate closely-allied species, or to make new ones, unduly emphasize the importance of any differences which the measurement of the bill presents.

I think we may now justly infer that the normal length of a bird's beak—that of a Mealy Redpoll, for instance, in a state of confinement, would equal that of its maximum development in a state of nature.

* "Yarrell's British Birds," vol. iv., p. 95.

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Supposing this inference to be correct, it may, of course, be applied with equal force in the case of all birds living amid artificial surroundings, the conditions being the same. A strong argument in support of this theory is the fact, that in cage birds we often find that one or both of the jaws greatly exceeds the normal length, so much so as to be detrimental, or even fatal, unless checked, to the unfortunate bird. As a case in point, I was lately shown a Crossbill, whose jaws had so far exceeded their natural limits as to threaten the well-being of the bird, unless shortening was speedily resorted to. This bird had been for some time in confinement, and was fed chiefly upon hemp and other small seeds. Now the Crossbill is particularly fond of the seeds of the various conifers, and in a wild state these form no small portion of its food. As many of these seeds have to be separated from very hard cones (lignified bracts of the flower), the bill gets just the amount of wear necessary to keep it within its proper limits. I should like to remark *en passant* that the older zoologists seem to have viewed the remarkable bill of the Crossbill as a kind of natural malformation, for De Buffon, writing in 1775, described the beak of this bird as a defect—an error of Nature, which could not fail to be very inconvenient to the bird in feeding.

In some cases the cause of overgrowth is somewhat obscure. Some time since I was shown a Pigeon but a few days old, and, therefore, quite unable to make any use of its beak, which had the upper half of the latter so much longer than the lower that it was found expedient to shorten it. At the time of hatching both jaws were normally developed, and the upper showed no signs of elongation until some time after, when the increase was very rapid. A similar instance brought under my notice at about the same time was that of a Black Hamburg Cockerel. In this bird both jaws retained their normal length until it was some six months old, when the upper beak-sheath suddenly increased in length and had to be cut. This bird was confined in the same fowl-house as several others, so that the conditions of life were precisely the same. I can only imagine that some unknown and sustained stimulus must have been given to the horn-secreting cells at the base of the sheath.

Pigeon fanciers seem to be not unfamiliar with malformed beaks, as, in seeking material for this Paper, I had occasion to consult a work devoted to the treatment of Domestic Pigeons, and found the following statement:—"The pigeon-house is troublesome on all birds unable, from a malformed beak, to preen themselves." I regret that no further enlargement of this statement was to be found in the book.*

Bland Sutton, in his "Evolution and Disease," figures and describes a very interesting and remarkable malformation in the bill of a Parrot. He says:—"The bird was found dead in Australia, and an examination of the body did not furnish any evidence leading to the suspicion that it had ever been in captivity. In this Parrot the upper part of the beak measures sixteen centimetres following the curve; it is difficult to

* See Bibliography.

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imagine how the bird lived so long." A reference to the illustrations shows the sheath of the upper jaw to have described rather more than half a circle, the tip apparently burying itself amongst the feathers of the throat. In the mandible, the sheath has grown upwards, thus leaving a considerable space between the cutting edges of the jaws.

I must now direct your attention to those malformations which I have previously referred to as being directly due to injury. These may be sub-divided into two forms :—

1. Where the jaws have been more or less severely injured and afterwards, on healing, become distorted.

2. Where the injury has been attended by overgrowth; in which case only one of the jaws—upper or lower—will have been injured.

Some time since I came across a very interesting case, which will amply suffice to illustrate the first of these two divisions. The unfortunate subject was a Skylark, *Alauda arvensis* (Linn.). In this bird the anterior portion of the mandible, from just behind the symphysis, had been entirely removed, so that the two rami were but imperfectly held in position by the muscular tissue forming the floor of the mouth. The upper jaw had suffered considerable damage, and had altered much in contour. The greater part of the right side of the beak had been removed; that of the left remained. After the healing process was completed, but little of the under jaw remained; the upper was much curved in a downward direction, and truncated at the tip.

Injury to one jaw, attended by overgrowth of the horny sheath of the other, is well illustrated by the two following cases, in both of which, as in the previous instance, we may, I think, with tolerable certainty, trace the work of firearms.

In the first, a Great Titmouse, *Parus major* (Linn.), there is a small but distinct cavity in the left side of the sheath of the upper jaw, probably a shot wound, but further than this there is no other apparent injury. But the sheath of the mandible has much exceeded its normal length, and has grown in an upward direction. The second case is that of a Starling, *Sturnus vulgaris* (Linn.). In this bird the upper jaw has been shockingly mutilated, whilst the sheath of the mandible, or lower jaw, has more than doubled in length. The greater part of the upper jaw is missing, there being but a short, irregular, and slender bar of bone, thinly invested with the common horny integument, attached to the base of the left side of the jaw. The sheath of the mandible, but for a very slight hollowing along the tomia, or cutting edge, may be said to be perfectly straight.

It is not a difficult matter to account for overgrowths such as these, as for some little time after the injury has been inflicted, the pain which would be caused by any attempt to raise or hold food in the jaws would be great, and feeding would consequently only be indulged in under dire necessity. Thus the enforced inaction of the beak, together with the stimulus given to the horn-secreting cells of the sheath, from the in-

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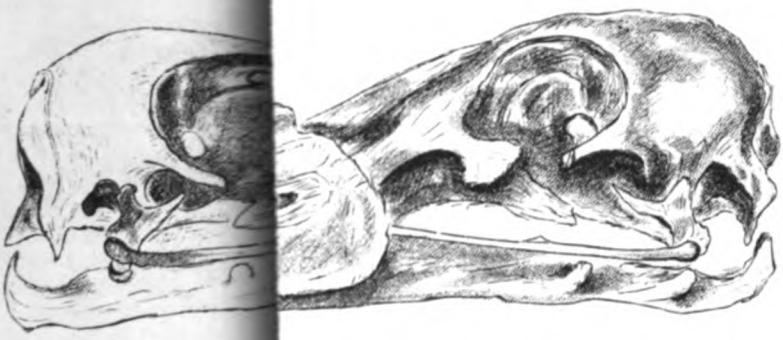

Right side of skull.—The narial orifice perfect.

Upper surface of skull showing distortion of facial elements.

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creased supply of blood to the region of the injured part, would naturally tend to create abnormal growth.

Malformations arising from disturbing influences during fœtal life, are, as I have previously remarked, not so common as those which we have been considering. I propose to refer the following four cases to causes of this nature, but I can only speak authoritatively about one of them, although I think the evidence which the remaining three bear in themselves, is almost sufficient to justify my having reserved them for consideration under this head.

Some time since, I was shown a number of ducklings of but a few days old, one of which possessed a remarkably malformed bill, which I have figured in the plate accompanying this paper. When alive it was, I assure you, a most curious looking object, and it was particularly so when feeding. This feat it accomplished by plunging its mandible into the midst of its food (a mixture of meal, &c., placed in a trough) and contriving to raise upon its free end,—for you will observe that the mandible is much longer than the upper jaw,—a bolus of food which it passed backwards into the mouth by the help of its tongue. The bird lived and thrived well; and was at last selected as a fitting subject to aid substantially in promoting Christmas festivities. I should remark, however, that it appeared quite unable to preen its feathers, which were in a very dirty and abraded condition. A reference to the two uppermost figures will give an idea of the appearance of the beak as a whole, before the removal of the sheath *(rhamphotheca)*. In the two lower figures representing the upper and lower aspects of the skull, it will be seen that the bill is much twisted towards the right, so much so indeed, that this side of the jaw has been quite forced back upon the head, and the nostril has been completely obliterated; on the left side the nostril is perfect in form and function. After having made these sketches, I removed the *rhamphotheca*, and this laid bare the true state of affairs.

The disturbance seems to have affected nearly the whole of the facial portion of the skull, but is confined to this region. Viewed along the ventral surface, it will be seen that the vomer, instead of lying in the middle line, is inclined at a considerable angle, the direction being from right to left; the palatines take a like course, lying parallel with the vomer. The quadrato-jugal of the right side is bowed outwards, that of the left being straight. This has evidently been forced out by the ingrowing maxilla. The palatal foramen lies considerably to the left of the median line—its normal position—and follows the curve of the mandible, as also do the canals for the palatal nerves. An inspection of the upper surface of the skull shows that the frontal bones are of unequal length, that of the right side being the longest, and normally developed. The right side of the jaw is doubled back under this, folding the narial orifice upon itself. The left and shorter half of the frontal bone is abnormally short, but the narial opening of this side, so far as purposes of respiration are concerned, is well developed.

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Possibly, such a malformation may be accounted for by the theory that the bird's head may have become displaced at some period during its development, so that the beak became pressed against the unyielding shell-wall. Thus the growth of the frontal bone of the left side of the head (that nearest the shell we must suppose) would be arrested, and the jaw, so long as it continued to grow, would follow the curve of the shell, the apex turning upwards, and towards the right side, thus restricting the growth of this side of the jaw. This would account for the narial orifice being folded back upon itself. The free growth of the frontal bone of the right side, however, has contributed in no small degree to this end.

The pressure of the inward growing jaw would, of course, cause the bowing out of the quadrato-jugal and the derangement of the palatines and vomer.

FIG. 1.

FIG 2.

SKULL OF DOMESTIC PIGEON WITH MALFORMED BILL.

In the annexed figure of a skull of a Pigeon, we have a malformation very similar to that just described in the Duck. The two sketches here produced I have taken from the actual specimen—Fig. 1 shows the superior, and Fig. 2 the inferior aspects of the skull. An examination will show that the upper jaw has been turned from right to left (or in the opposite direction to that in the previous case), that it is directed upwards from the base, and that the tip is curved downwards rather more than usual, giving the bill, before the removal of the *rhamphotheca*, a hooked appearance. The frontal bone of the right side is rather broader and more prominent than that of the left. The remaining elements of the facial portion of the skull have suffered little or no disturbance, only the quadrato-jugal of the right side being slightly bent inwards.

Mr. J. Bland Sutton, to whom I submitted this specimen, informs me that the deformity in this case is congenital.

The remaining cases are, though interesting, not nearly so important as the two we have just been considering, inasmuch as they have been

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furnished by adult specimens, all of them moreover wild birds; thus the only evidence obtainable, proving the embryonic character of their respective distortions, is purely circumstantial. I will describe the least of these —a Starling (*Sturnus vulgaris*, Linn.)—first. In this bird the upper jaw is shorter and somewhat flatter than usual, and the culmen (or ridge of the beak) is transformed into a groove which arises in the region above the nostrils, thinning out as it nears the apex. This jaw is perfectly symmetrical and bears no trace of injury. The mandible is much longer than normally, and turns upward, ending in a sharp tip. I should remark that the *rhamphotheca* has not been removed. The plumage of this bird is beautifully clean and brilliant, and it was in perfect condition when killed, so that it does not seem to have suffered from Nature's handicapping.

A malformed beak, singularly resembling that of the starling just described, is figured in Yarrell's "British Birds." In this case the bird was a Rook (*Corvus frugilegus*, Linn.) The chief points of difference are that the culmen is perfect and that the tip of the upper jaw crosses over to the right side of the mandible. It is referred to indirectly thus: —"Malformations of the beak are by no means uncommon among birds, and in the present species a monstrous growth of the horny covering . . . has been frequently noticed. . . ."

I bring these notes to a close with a very interesting malformation of the bill of a Hooded Crow (*Corvus cornix*, Linn.) In this bird the jaws are not only smaller than usual, but they cross one another, after the manner of the beak of the Cross-bill, from which it differs, however, in that both jaws are directed downwards, the tip of the lower passing to the right side of that of the upper. The curve of the upper jaw arises almost from its base; the cutting edges are placed obliquely to one another, and along the posterior two-thirds of the edge of the left side there runs a slight tumid swelling. The mandible has received the greatest amount of twisting. The left ramus is concave, the right convex; the cutting edges, as in the upper jaw, lie obliquely to one another. The bill sheaths in this case have not been removed.

In conclusion, let me say that I shall be glad of any further notes on this subject, in order that I may at some future time be enabled to place before you a more complete history of pathological phenomena of this nature; besides, any fresh case throws new light upon those that have been previously described. In the present Paper I have not attempted to enter very fully into the subject, indeed the time at my disposal just now is so limited that any desire on my part to do so would have to remain ungratified. I have also purposely refrained from any but the most cursory remarks upon the anatomy of the bill; not only because it was unnecessary in a Paper like the present, but also because I hope shortly to be enabled to prepare a series of specimens illustrating the morphology of birds' bills for the Index Collection of our Museum, when I should be glad to lay before you a descriptive account of the same.

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The Bibliography appended by no means represents the literature of the subject, although it embraces much interesting matter.

I wish here to thank those kind friends who have so greatly assisted me, either with notes or by the loan of specimens; particularly to Mr. J. Bland Sutton, F.R.C S, &c., Mr. J. H. Gurney, F.Z.S., Mr. W. Shipley, M.R.C.V.S., and Messrs. G. Ditcham and B. Dye.

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Nos. 2, 3, and 6 deal solely with the normal structure of the bill; Nos. 1, 4, 5, 7, and 8 with pathological conditions.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Tuesday, March 17th, 1891.—Mr. A. P. Moore, M.A., read a scholarly Paper "On the Study of Philosophy."

During the discussion that followed, it was recommended that the Paper be published in the Transactions. (Printed at page 286.)

This being the last Meeting of the Session, it was moved by Mr. A. H. Paget, seconded by Mr. T. C. Lee, and carried unanimously, that Mr. J. M. Gimson be elected Chairman of the Section for the ensuing Session.

It was moved by Mr. T. C. Lee, and seconded by the Chairman, and carried, that Mr. F. S. Herne be elected Secretary.

A very cordial vote of thanks was given to Mr. John Scampton for his services as Secretary during the past eight Sessions.

W. SIMPSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

March 18th.—Paper. Mr. Carter read a Paper on "Heredity." The author gave an account of the points at issue between the two Theories of Heredity, the ultra-Lamarckian and the ultra-Darwinian. The former maintained that modifications of the organism, produced among the life-tissue of the individual by the effects of climate, food, use and disuse of parts, and the conditions of environment, can be inherited by its offspring; the latter holds that such modifications cannot be inherited, unless they are congenital in the reproductive powers of the parent organism, and that phenomena, attributed to the effects of use and disuse, &c., may be more rationally and satisfactorily accounted for by the process of Natural Selection.

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A notice was added of the different hypotheses proposed to explain the facts of Heredity, the chief being Darwin's "Theory of Pangensis,' Galton's "Stirp," and Weissmann's "Germ Plasm."

Mr. MOTT was in favour of the "Use" Theory, supporting this opinion by the instance of sporting dogs. He considered that the difficulty rests with the definition of the term "Tendency," as applied to molecules.

Dr. FINCH thought that "Tendency" was due rather to Chemical, than to Physiological, conditions.

Home Reading Circle.—Mr. MOTT pointed out that Lubbock does not insist upon the "Modification of Flowers" being entirely due to insects.

Circulation of Periodicals.—It was decided that each Periodical be, originally, left in the hands of members using it for four days, including the day of receipt and the day of passing on.

Also that a second copy of "Nature" and a copy of the "Entomologists' Record" be provided and paid for out of the funds of the Section.

Mr AGAR suggested the addition of a copy of the Society's "Transactions" for circulation among the members of the Section, who are not also members of the Society. Mr. MOTT undertook to see to this matter.

April 13th.—Paper. Messrs. BOUSKELL and HEADLY read a Paper "On certain Macro-Lepidoptera, found in Leicestershire." This is printed in the Transactions, see page 365.

Exhibitions.—A Sea-pen *(Pennatula)*, Ants' Eggs soaked in native spirit and used for beads by the natives, a Black Pearl, and a small Globe Fish, all from South Africa; also nests of the Rose-leaf-Cutter Bee, by the CHAIRMAN.

Circulation of Periodicals.—The request that a copy of the Society's "Transactions" be circulated with the other Periodicals, was granted by the Council.

Herbarium.—The Sub-Committee was re-appointed to make arrangements for the reception and arrangements of specimens.

The proposed Excursion to Braunstone had to be abandoned, in consequence of the weather.

May 20th.—Paper. Mr. MOTT read a Paper on "Chlorophyll," printed in full on page 361.

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Herbarium.—The CHAIRMAN said that in conversation with Mr. CARRUTHERS, head of the Botanical Department at South Kensington Museum, he was informed that it was extremely desirable that the Herbarium should be in excess, rather than defect, and that plants should be collected from all the districts of the County, and even from the different altitude of the same district.

The CHAIRMAN explained a little more about the South Kensington Herbarium, and corrected a mis-statement which he had made respecting it in his "Notes on the Kew Herbarium." Sir J. HOOKER's suggestion was that the Kensington Herbarium should be mainly illustrative of Fossil Botany, which would ultimately take a geographical arrangement, and might then be further developed into a collection such as was suggested, viz.: a purely geographical one. The Kensington authorities demurred, as it would take away from the scientific character of their collection. They already possessed all the type specimens up to within the last fifty years; since then they had gone to Kew. The arrangement of their collection on the plan proposed was practically impossible, and hence there were really two parallel collections. As, however, the Kew authorities had paid more attention to Vascular plants, those at Kensington had devoted their attention more to the Cellular plants, and they had now the most extensive collection of such plants in existence. It may be noted that, though theoretically the union of living and dead plants, as at Kew, was most desirable for authors, it was yet found in practice that all the more important works had been compiled solely from dried specimens, and that no use whatever had been made of the living plants in the gardens.

Home Reading Circle.—A short discussion took place on "Protective Colouring." The CHAIRMAN expressed his opinion that the value of protective colouring was over-rated. Entomologists were not deceived by it, and those animals, therefore, which fed upon them, would have no great difficulty in finding their prey. The greatest enemy to insects, in his opinion, was the weather, and this was quite independent of colouring.

Excursion.—Seven members assembled at the Railway Station, but owing to the threatening state of the weather, only two proceeded by train to Sileby, the other five making their way to the Abbey Park. In consequence of the lateness of the season neither party had anything special to report.

Election of Officers.—Dr. COOPER proposed, and Mr. E. F. COOPER seconded, that the Rev. T. A. PRESTON be requested to continue in office as Chairman for another year. Carried unanimously.

Mr. MOTT proposed, and Dr. FINCH seconded, that Mr. J. J. W. KNOWLES be re-appointed Hon. Secretary. Carried unanimously.

Exhibitions.—A set of Flowers from the open garden, by the

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CHAIRMAN. Also part of the contents of the crop of a Great Bustard, shot at Chippenham, in Wiltshire, February 4th, 1891, which had been sent to Kew for identification, and promptly returned. It consisted of leaves of *Ranunculus repens*, *Cochlearia officinalis*, and of an unknown plant, also part of the thorax of a beetle. The presence of the leaves of *Cochlearis*, a seaside plant, showed that the poor bird had been killed within a very few hours of its arrival on our inhospitable shores.

The CHAIRMAN suggested for investigation the fertile flowers of Mercurialis perennis. The filaments of the two abortive stamens had been proved by a correspondent, Mrs. DORMAN, to secrete honey, thus attracting insects, and showing that the plant was Entomophilous and not Anemophilous.

He also stated that he had heard that the scales on the underground stems of the Toothwort *(Lathræa squamaria)* were hollow, and all the hollows were connected with one another. (2) That inside these hollows were both absorbent and excretory glands, as well as the mycelium of a Fungus. (3) That the glands as well as the mycelium were covered with Bacteria. (4) That the cause of this was unknown, but it might be a form of what is called "symbiosis," such as that of Lichens, which are now known to consist of an Alga and a Fungus. (5) That the attachment of *Lathræa* to its host is by numerous small suckers at the extremities of very fine rootlets

The Sub-Committee, appointed to draw up a scheme for the Leicestershire Herbarium, recommend:—

(1) That the arrangement of the Herbarium should correspond with that of the published Leicestershire Flora.

(2) That its objects should be, firstly, to illustrate the published Flora, and authenticate the localities there recorded; and, secondly, to assist Botanical students, by exhibiting dried specimens of the County plants in the most complete and perfect manner possible, representing each species in all its phases of life.

(3) That where a species is recorded in some of the districts only, there should be a specimen, if possible, from each district and locality mentioned in the Flora; and that even such common species as are found in all the twelve districts should be represented by an ample series of examples.

(4) That a number of labels be prepared (say, 10,000), printed on rather thin paper, gummed at the back, and distributed to such members as are willing to assist.

(5) That the size of the mounting paper be 16 inches by 10 inches, that three reams be purchased, making 2,880 half-sheets, and that each half-sheet have the words, "Herbarium of the Leicester Literary and Philosophical Society," printed on the top right hand corner.

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(6) That the covering paper be brown, glazed on one side, and half an inch larger each way than the mounting paper.

(7) That a Cabinet be prepared of the following outside dimensions, viz.: height, 4 feet 2 inches; width, 2 feet 1½ inch; depth, 20 inches; that there be a plinth, 3 inches deep at the bottom; and that the remainder be divided up the centre with seven shelves on each side, forming, with the bottom, sixteen compartments, each 5 inches deep; that there be a double back with a space of 1 inch between the two, the inner back being made by a slat, 4 inches wide, up the centre, and a similar slat, 2 inches wide, up each side, thus forming a stop at the back end of each shelf, with a chamber behind, communicating with the whole; a supply of albo-carbon, or other antiseptic, being kept in the bottom of the chamber for protection against mould, moth and mites.

That the Cabinet be made of deal or cedar, with light oak front, top, and sides. The doors so hinged as to open flush with the inner sides of the side pieces, and the front edges of the shelves to be bevelled on the upper angle, so as to receive labels, showing the contents of each shelf.

(8) That the dried specimens, sent in by each collector, be unmounted and accompanied by labels with all the information filled in. The name of the plant is not *necessary*, though desirable.

(9) That all specimens, which cannot be fastened down by members of the Society, be sent in batches to London, to a proper person, unless some one capable of doing the work should be found in Leicester.

(10) That all specimens, when dried, be sent to one of the following "Receivers," Rev. T. A. PRESTON, Mr. MOTT, Mr. E. F. COOPER, Mr. CARTER, Rev. W. G. WHITINGHAM; who have undertaken to manage the Herbarium for the present. Fresh specimens (accompanied with labels) may be sent to Mr. PRESTON, who will dry them, if suitable.

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

March 16th, 1891.—Mr. J. PALMER, of 13, Bartholomew Street, was elected an Associate of the Section.

A valuable Paper on the Geology of the Keuper in the vicinity of Leicester was read by Mr. MONTAGU BROWNE, in which he gave a *resumé* of the labours of former observers, and then proceeded to the consideration of Mr. JAMES PLANT'S Section, which appeared in the Quarterly Journal of the Geological Society for 1856. The author, while agreeing in the main with Mr. PLANT'S notes on the physical Geology of the

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subject, took exception to the view that the thick bedded sandstone was continuous throughout the County on the lines laid down by Mr. PLANT, as the evidence of various subsequent borings along that line did not bear out the theory advanced. On the contrary, the author thought that it would be better to consider the sandstones of the Shoulder of Mutton and Dane Hill districts as merely a local thickening on an old shore or shoal line, whilst, at the same time, the upper members as interpreted by Mr. PLANT did not, of course, include the Rhætic formations subsequently discovered.

The Paper was illustrated by a one-half size section of a sandstone pit lately examined by Mr. BROWNE, a skeleton map of the district, an enlargement to scale (25 feet to the inch) of Mr. PLANT'S section, and a vertical and horizontal section, on a large scale, from the Shoulder of Mutton Hill to Thurnby Lodge, a distance of five miles, prepared by the author, in which the various formations passed through were shown to a minimum depth of 200 feet below the surface.

In the discussion which followed, the Rev. R. W. LANCASTER made some remarks relative to the formation and deposition of Liassic and Keuper beds, and also alluded to the formation of Gypsum bands. He also kindly promised to give a Paper on a future occasion, dealing with the Chemistry of local formations.

The CHAIRMAN, who made some remarks relative to the sub-ærial rocks, was followed by Mr. A. T. DRAPER, who, in the course of his speech, called attention to the admirable accuracy displayed in the preparation of the Sections, which, he strongly urged, should be permanently preserved in the Transactions of the Society.

The CHAIRMAN afterwards proposed that the Paper should be printed *in extenso*, and the resolution, together with a vote of thanks to Mr. BROWNE, was carried unanimously.

April 13th.—Mr. J. G. PARR, M.R.C.V.S., read a very interesting Paper on "Some Internal Parasites of the Domestic Animals," in which, after stating that his remarks would be confined to a description of members of the orders *Trematoda*, *Cestoda*, and *Nematoda*, he proceeded to deal at some length with the structure and strange life-histories of those parasites commonly known as intestinal worms and "flukes." Mr. PARR next mentioned the worms *(Strongylus)* which are responsible for the diseased condition of many horses, calves, and sheep. It was shown how one form, occurring in the Horse, bores its way through the walls of the intestinal tract into the surrounding blood vessels, causing aneurismal swellings, and also how the disease known as "Husk" in calves and sheep is caused by the presence of multitudes of similar worms infesting the pulmonary tissue and bronchial tubes

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of the affected animals. An interesting description of the well known *Trichina spiralis* which, through the medium of "measly" pork, gives rise, in man, to the disease called Trichiniasis, was next given, the latter portion of the Paper being devoted to an admirable account of the extraordinary series of changes which both the Tæniæ and Flukes *(Distoma)* pass through in their progress from birth to maturity. The value of the Paper was much enhanced by the information which Mr. PARR's practical experience enabled him to give, when dealing with the various diseases mentioned, and also by the exhibition of some admirable diagrams, and preserved examples of the majority of the parasites described.

At the conclusion of the Paper, Mr. C. J. BOND took the Chair for Dr. POPE, who was obliged to leave in consequence of a pressing engagement, and a discussion took place, in which Drs. BOND and DAVIES, with other members, joined, after which a hearty vote of thanks was passed to Mr. PARR.

May 11th.—Mr. **H.** HOWITT, of Cavendish Road, Aylestone Park, was elected an Associate of the Section.

The SECRETARY presented the Annual Report and Balance Sheet, which were adopted.

Mr. MONTAGU BROWNE, F.Z.S., F.G.S., was elected Chairman for the ensuing year, on the proposition of Dr. POPE, seconded by Mr. W. A. VICE. Dr. POPE was elected Vice-Chairman on the proposition of Mr. MONTAGU BROWNE, seconded by Mr. E. PATTISON, the present Secretary being unanimously re-elected.

After a vote of thanks had been passed to the CHAIRMAN and SECRETARY for their services during the past year, Mr. W. A. EVANS read some notes on the Fauna, &c., of the North West Territory, consisting of personal reminiscences of the physical features, Flora, and Fauna, of the Alberta District. The arid, wind-swept plains were first described—the great home of the Buffalo not more than 15 years ago; the old Buffalo tracks still persisted in the dry ground, and their bones occurred in incredible quantities, but the practical extinction of this fine animal was, sad to say, an accomplished fact. The Badger, also, was stated to be almost extinct. In commenting on the presence and habits of the "Gopher," found on the high lands, the lecturer expressed himself unable to satisfactorily account for the source from which the animals obtained their water, so destitute of moisture was the upper prairie land. Animal and vegetable life occurred most plentifully in the stretches of low lying land which intersected the country like channels. Here streams were found, on the banks of which cotton trees and willows flourished, being sheltered from the fierce winds by the steep walls which

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separated these valleys from the higher prairies. In enumerating the various forms of life met with in these situations, Mr. EVANS mentioned, amongst others, the Rodent known as the "Jack Rabbit," stating that measurements taken of the track of this animal gave a distance of no less than eleven feet from track to track. The Porcupine *(Erithizon dorsatus* was met with, and numerous evidences of the presence of Beaver were observed in the streams, and in this connection interesting information was given respecting their mode of cutting logs for building, and also various methods for trapping the animals resorted to by hunters. Ermine and Lynx were mentioned as occurring; whilst birds abounded. Geese, Swans, and Ducks, being most noticeable on the lower ground, though the Snow Bunting, Great Grey Shrike, Magpie, and several species of Hawk, were also met with.

The Paper was illustrated by blackboard sketches, and at its conclusion a short discussion followed, after which the thanks of the meeting was unanimously tendered to Mr. EVANS.

Mr. MONTAGU BROWNE handed in some dates for the arrival of Migrants—viz:—

Yellow Wagtail	April 16th.	(W. P. PYCRAFT.)
Swallow	„ 18th.	(M.B.)
Sand Martin	„ 20th.	„
Cuckoo	May 3rd.	„
Landrail	„ 5th.	„

He also recorded the occurrence, at Lutterworth, of a bird new to the County list, viz.: an immature male Gadwall *(Chaulelasmus streperus)*, which Major JARY had very kindly presented to the Museum. Mr. BROWNE further stated that he had recently obtained a specimen of a rare Fish *(Ptycholepis minor*, Egerton.*)* from the lias of Barrow-on-Soar, the type specimen (the only other obtained) being in the British Museum.

A discussion took place relative to dates for Sectional Excursions, the matter being finally left in the hands of the Chairman and Secretary.

Exhibits —Gadwall *(Chaulelasmus streperus)*, immature male, shot at Lutterworth.—Mr. MONTAGU BROWNE.

Beetle *(Dynastes hercules)*, from Dominica.

Various Shells, viz: Specimens of *Spondylus*, one of them—*S. pictorum*—being exceptionally fine; and *Oliva porphyrea*.—Mr. W. A. EVANS.

F. M. POPE, *Chairman*.

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Announcements.

SECTIONAL MEETINGS.

SECTION "D."

Chairman—Rev. T. A. Preston, Thurcaston, Leicester.

Secretary—Mr. J. J. W. Knowles, 25, St. Stephen's Road, Highfields, Leicester.

Evening Meetings—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days—The second Wednesday in each Summer month, at about 3 p.m.

1891.

July 8.—Excursion to Swannington Bog. (By train, 2.30 from Leicester.)

15.—Evening Meeting. Discussion on Questions submitted by Members.

Sept. 9.—Excursion to Swithland, returning by Thurcaston.

16.—Evening Meeting. Paper.

T. A. PRESTON, *Chairman.*

SECTION "E."

Chairman—Montagu Browne, F.Z.S., F.G.S., Town Museum.

Secretary—F. R. Rowley, Town Museum.

EVENING MEETINGS.

1891.

July 6.—Paper by Mr. Harold Littledale, "Notes on Indian Shikar,* by an old Shikari."

(*Big Game Shooting in India.)

August.—No Meeting.

Sept. 7.—Notes and Exhibits by various Members.

MONTAGU BROWNE, *Chairman.*

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TRANSACTIONS

OF THE

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SOCIETY.

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VOL. II.

PART IX., OCTOBER, 1891.

LEICESTER:
GEO. GIBBONS & Co., 49, KING STREET.
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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

VOL. II.

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ROBERT LOUIS STEVENSON.

By C. J. Billson, M.A. (Read before Section "A.")

I.

In one of his books Mr. Stevenson has expressed his mature conviction that the happiest lot on earth is to be born a Scotchman, and he also accounts himself fortunate in having sprung from a great race of engineers. He is the great-grandson of Thomas Smith, first engineer to the Northern Board of Lights, grandson of Robert Stevenson, the builder of the Bellrock Lighthouse, with whom Sir Walter Scott made his voyage round the coast of Scotland in the year 1814, and son of Thomas Stevenson, the well-known lighthouse engineer, who died a few years ago. On his mother's side he has inherited a different tradition. She was the grand-daughter of that Dr. Smith, of whom Burns wrote:

"Smith opens out his cauld harangues,"

and she was the daughter of another Scotch minister, Dr. Balfour. Two stories may serve to shew something of the character of this stern Presbyterian grandfather of Mr. Stevenson. In the delightful and Lamb-like essay called, "A Penny Plain and Twopence Coloured," Louis Stevenson recalls a certain evening of his childhood, when he brought home to read "The Arabian Nights' Entertainments," in the fat old double-columned volume with the prints. "I was just well into the story of the Hunchback, I remember, when my clergyman-grandfather (a man we counted pretty stiff) came in behind me. I grew blind with terror. But instead of ordering the book away, he said—he envied me. Ah! well he might!"

Another good story about this Dr. Balfour is told in the paper called "The Manse."

"He had over walked in the teeth of an east wind, and was now near the end of his many days. He sat by the dining-room fire, with his white hair, pale face, and blood-shot eyes, a somewhat awful figure; and my aunt had given him a dose of our good old Scotch medicine, Dr. Gregory's powder. Now that remedy, as the work of a near kinsman of Rob Roy himself, may have a savour of romance for the imagination, but it comes uncouthly to the palate. The old gentleman had taken it with a wry face; and, that being accomplished, sat with perfect simplicity, like a child's, munching a 'barley-sugar kiss.' But when my aunt, having the canister open in her hands, proposed to let *me* share in the sweets, he interfered at once. *'I had had no Gregory; then I should have no barley-sugar kiss'*: so he decided with a touch of irritation. And just then the phaeton coming opportunely to the kitchen door—for such was our unlordly fashion—I was taken for the last time from the presence of my grandfather."

Mr. Stevenson asked himself in after years with some wonderment,

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what he owes to this Presbyterian ancestry. The answer is, I think, that he owes to them not less than to his father's line of shrewd and strenuous workers, that which his brother-idealist Hawthorne owed to his Puritan forefathers—a moral tradition that gives stability and coherence to his imaginative work. Like Hawthorne, he is the artistic transmitter to the world of that spiritual hoard which had been accumulated by his family through so many silent years. For his engineering forefathers he has an enthusiastic admiration, which he gracefully expressed by giving to his house at Bournemouth the name of one of their great triumphs, the lighthouse "Skerryvore":—

> "For love of lovely words, and for the sake
> Of those my kinsmen and my countrymen,
> Who early and late in the windy ocean toiled,
> To plant a star for seamen."

And in one of his poems he contrasts himself with those stubborn builders of facts, in a spirit of modest self-depreciation.

> "Say not of me, that weakly I declined
> The labours of my sires, and fled the sea,
> The towers we founded, and the lights we lit,
> To play at home with paper, like a child.
> But rather say: In the afternoon of time,
> A strenuous family dusted from its hands
> The sand of granite, and beholding far
> Along the sounding coasts its pyramids
> And tall memorials catch the dying sun,
> Smiled well content, and to this childish task
> Around the fire addressed its evening hours."

Louis was not, however, the first of the Stevensons who betrayed signs of this new bent in the family's genius. His father also had something in him of the instinct of literary style. "His use of language," says his son, "was both just and picturesque; and when, at the beginning of his illness he began to feel the ebbing of this power, it was strange and painful to hear him reject one word after another as inadequate, and at length desist from the search, and leave his phrase unfinished, rather than finish it without propriety."

Louis, who inherited this choiceness in diction, served nevertheless a long apprenticeship in the art of composition. "All through my boyhood and youth," he writes, "I was known and pointed out for the pattern of an idler; and yet I was busy on my own private end, which was to learn to write. I kept always two books in my pocket, one to read, one to write in. As I walked, my mind was busy fitting what I saw with appropriate words; when I sat by the roadside, I would either read, or a pencil and a penny version book would be in my hand to note down the features of the scene, or commemorate some halting stanzas. And what I thus wrote was for no ulterior use; it was written consciously for practice." When anything particularly pleased him in a book, he would sit down at once, and set himself to ape that quality. "I was unsuccessful, and I knew it; and tried again, and was again unsuccessful, and always unsuccessful."

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His first appearance in print was in a magazine started by the Speculative Society of Edinburgh University; to which he contributed among other papers, that charming essay upon an "Old Scotch Gardener," which has since been reprinted in the volume of "Memories and Portraits." This magazine did not however belie the reputation of College periodicals. "It ran four months in undisturbed obscurity, and died without a gasp." Stevenson reviewed the episode in the spirit of a true artist and sound workman. "I told myself that the time was not yet ripe, nor the man ready, and to work I went again with my penny version books, having fallen back in one day from the printed author to the manuscript student."

Besides this rigorous training in the power of expression, Mr. Stevenson enjoyed a rather exceptional apprenticeship in the art of observation. Many little memories of men and scenes, which afterwards fell into the framework of his writing, were consciously stored up, as he tells us, with that purpose in view, upon the occasions when he accompanied his father in the lighthouse steamer, or enjoyed a holiday alone with Nature in some lighthouse settlement. For he was a wanderer from his youth up, and most of his records are drawn directly from his own experience. Apart from the autobiographical reminiscences scattered throughout his essays and novels, he has given us three books of travel, which for many reasons deserve the first place in a consideration of his work.

II.

Books of travel, I call them, but they are rather books of reflection and humour. Mr. Stevenson is, like many Scotchmen, a cosmopolitan, a "Scotchman of the world." Accidental variations upon the surface of life do not give him much concern. Whether he be in California or Belgium, in the district of the Cevennes, on the waters of the Oise, in the streets of his own "picturesque Edinburgh," or in the islands of the Pacific Ocean, he is always first and foremost—what John Bunyan calls "a traveller through the wilderness of this world." The foreground of all his pictures is occupied by human life, and the little groups and scenes which fill the canvas are touched in with such degress of light and shade as may best help to illustrate the central figure. Yet the special attitude of life which dominates each book is naturally determined by the general impression left by those subordinate details. Thus the humour of the Travels through the Cevennes has a graver tone than that of the Inland Voyage. It is the record of a journey undertaken with the sole companionship of a donkey over the mountainous region southward from Velay. Modestine, the donkey, carried the traveller's baggage, which comprised a sheepskin bag about six feet square in which he would often sleep, alone and tranquil, under the stars. Mr. Stevenson met a Plymouth Brother, and told him, on being questioned, that he much preferred this mode of sleeping to a close and noisy alehouse. "Now I see," said the Plymouth Brother, "that you know the Lord." And besides the

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religious influences of night and mountain solitudes, the mind of the traveller caught a serious air from the simple faith and piety of the inhabitants of the district. He visited the Trappist Monastery of "Our Lady of the Snows," where an old soldier, turned monk, tried to convert him to the orthodox faith. Stevenson appealed to the family affections. "Your father and mother?" said the priest, "Very well, you will convert them when you go home." "I think I see my father's face," says Louis Stevenson, "I would rather tackle the Gaetulian lion in his den than embark on such an enterprise against the family theologian." Other people tried to convert him, without success. "I think I should not leave my old creed for another, changing only words for other words, but by some brave reading, embrace it in spirit and truth, and find wrong as wrong for me as for the best of other communions."

The temper of the Inland Voyage is more idyllic. It is written in a more light and holiday humour. The genius of the Oise is quite another divinity than the spirit of the Cevennes mountains. The traveller is not alone, but shares the company of a friend, and they do not journey by slow and silent marches among solitary hills, nor sleep either among grave fathers and earnest peasants, or in the arms of Nature. Their voyage on the contrary is a rapid dance down noisy and hurrying rivers in canoes; their lodging is chiefly in country inns, the resort of bagmen and strollers.

And so while the central motive of each of these two books is the freedom of the human spirit, this Inland Voyage is not concerned with that kind of freedom which is eulogised in the Travels with a Donkey—the liberty of man's soul, unsectarianism, and the life according to Nature. In this lighter narrative, the response is rather to that craving for unrestraint which is spoken of in Prince Otto as one of Nature's spiritual ditties, that has not yet been set to words or human music: "The Invitation to the Road," freedom from convention, from the iron routine of custom and respectability, from "the daily drudgery of the desk's dead wood." Mr. Stevenson always has an idealist's tenderness for the unrespectable, who have some ideal at least different from that of the dull majority. "That is the kind of thing that reconciles me to life," he says, when he is invited to witness the performance of a family of strolling actors free of charge. "'Monsieur understands,' said the father of the troop, 'the vanity of an artist!' Save the mark! The vanity of an artist! That is the kind of thing that reconciles me to life: a ragged, tippling, incompetent old rogue, with the manners of a gentleman and the vanity of an artist, to keep up his self-respect." In case, however, anyone should be inclined to take too seriously Mr. Stevenson's leaning to the unrespectable, let him peruse carefully his essay on Francois Villon in "Men and Books," and the pitiful story from Villon's life in "The New Arabian Nights" called, "A Lodging for the Night."

Nothing has been written since Sterne in the same vein of humorous reflection as these travels in the Cevennes and Belgium. Indeed it often

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occurs to one that Mr. Stevenson is aping the quality of Sterne just as he used to do in his penny version books. Would he have shed tears at parting with Modestine, if there had been no weeping over that dead ass in the Sentimental Journey? Yet he is nearer to Nature than Sterne was in the Sentimental Journey. We, too, are loath to part with Modestine. There never was such a dear donkey. "She had come to regard me as a god. She loved to eat out of my hand. She was patient, elegant in form, the colour of an ideal mouse, and inimitably small. Her faults were those of her race and sex, her virtues were her own." No wonder Mr. Stevenson wept. And he distinctly surpasses the author of the Sentimental Journey in the literary capital which he makes out of dead donkeys. He has solved Sam Weller's puzzle as to what become of donkeys when they die. Their skins are used, it seems—like the skin of a certain great partisan leader who left it for the purpose—to cover drums. "What a picturesque irony is there in that! As if this long-suffering animal's hide had not been sufficiently belaboured during life; now by Lyonnese costermongers, now by presumptuous Hebrew prophets; it must be stripped from his poor hinder quarters after death, stretched on a drum, and beaten night after night round the streets of every garrison town in Europe. And up the heights of Alma and Spicheren, and wherever death has his red flag a-flying and sounds his own potent tuck upon the cannons, there also must the drummer boy, hurrying with white face over fallen comrades, batter and bemaul this slip of skin from the loins of peaceable donkeys. Generally a man is never more uselessly employed than when he is at this trick of bastinadoing asses' hide. We know what effect it has in life, and how your dull ass will not mend his pace with beating. But in this state of mummy and melancholy survival of itself, when the hollow skin reverberates to the drummer's wrist, and each dub-a-dub goes direct to a man's heart, and puts madness there, and that disposition of the pulses which we, in our big way of talking, nickname Heroism:—is there not something in the nature of a revenge upon the donkey's persecutors? Of old, he might say, you drubbed me up hill and down dale, and I must endure; but now that I am dead, those dull thwacks that were scarcely audible in country lanes, have become stirring music in front of the brigade; and for every blow that you lay on my old great coat, you will see a comrade stumble and fall."

Time will not allow me to do more than mention Mr. Stevenson's third volume of personal adventure, "The Silverado Squatters." It describes a kind of gipsy picnicing upon the top of a Californian mountain, and is something of a literary curiosity as being the faithful record of a honeymoon.

III.

Since these well remembered adventures of his youth, it is no secret that the hand of sickness has restrained Mr. Stevenson from this kind of

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enterprise. An invalid, driven by doctors' orders from one health resort to another, spending much of his time in bed and dating from that untoward address a great deal of his writing, writing often accomplished only in the intervals of physical pain, he could give ease to his passion for liberty in no other way than by imagining adventures. And this confinement has driven him, by a common law of human nature, into a handsome exaggeration of the adventurous spirit. For a man thus compelled to inactivity of the body, no ordinary romance is sufficient to redress the balance of energy: the liberty of imagination which would solace him must be inversely proportioned to the actual pinch of restraint. And so it is with Mr. Stevenson. "The New Arabian Nights" and "The Dynamiter" are at the extreme pole of romance. No one—with the exception of Mr. Oscar Wilde—has ever been so voracious of paradox as to accuse Mr. Stevenson of an undue subservience to facts. The words "improbable" and "impossible" are quite inadequate to express the delicious incongruity and audacity which characterise every page throughout these grotesque and fantastic stories. They could have been engendered only in a sick room, or in a prison, or like the immortal burlesque of Rabelais, in a monk's cell. "The story of the Young Man with the Cream Tarts," in the Suicide Club series, is perhaps the most audacious of these freaks of fancy, and is equalled only for sheer paradox by the opening scene of "The Dynamiter." The peculiar maliciousness with which Mr. Stevenson makes sport of the common sequence of events is aggravated by his everyday manner. Take for example the "Story of the House with the Green Blinds," in "The Rajah's Diamonds." It begins thus:—

"Francis Scrymgeour, a clerk in the Bank of Scotland at Edinburgh, had attained the age of twenty-five in a sphere of quiet, creditable, and domestic life. His mother died while he was young, but his father, a man of sense and probity, had given him an excellent education at school, and brought him up at home to orderly and frugal habits. Francis, who was of a docile and affectionate disposition, profited by these advantages with zeal, and devoted himself heart and soul to his employment. A walk upon Saturday afternoon, an occasional dinner with members of his family, and a yearly tour of a fortnight in the Highlands or even on the continent of Europe, were his principal distractions, and he grew rapidly in favour with his superiors, and enjoyed already a salary of nearly two hundred pounds a year, with the prospect of an ultimate advance to almost double that amount. Few young men were more contented, few more willing and laborious than Francis Scrymgeour. Sometimes at night, when he had read the daily paper, he would play upon the flute to amuse his father, for whose qualities he entertained a great respect."

Those who know the manner of Mr. Stevenson's irony will not be surprised to find this excellent and common-place young man hurled, in the course of a few pages, through adventures the wildest, and episodes the most romantic that any fiery and imaginative spirit could desire

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to encounter. And the joke of the thing is the quiet matter-of-fact way in which this bank clerk takes his experiences. For instance, in the intervals of his extraordinary campaign in Paris, in order that he might not be entirely idle, and to give a certain colour to his way of life, he purchased Euclid's geometry in French, which he set himself to copy and translate. With a man of that sort for their hero, the most fantastic and absurd tales obtain the air of common-place.

The most popular of Mr. Stevenson's short stories is the "Strange Case of Dr. Jekyll and Mr. Hyde," in which the fascinating psychological and moral problem of dual personality is most vividly portrayed. This tale, like the equally powerful story of Markheim, has a strong moral side, being obviously in the main an allegorical description of the struggle between flesh and spirit; though it may be observed that the interpretation of the matter is left entirely to the reader's choice, Mr. Stevenson refusing to violate the principles of his art by offering explanations. And therefore the work does not appeal to that class of readers who detest all extravagant fiction unless it be explicitly put forth as Parable. And as a fact the book was not written, I believe, as a conscious work of art, but is a literary phenomenon of the same kind as Coleridge's "Kubla Khan." A friend asked Mr. Stevenson why he had not made the conclusion of the book more satisfactory by giving a decided victory to the good principle over the evil? And he replied:—"I could not help it—I had not a voice in the matter. It was all a dream that I had one night, and when I woke I wrote it down in red hot haste just as I remembered it." It would be interesting to know what Mr. Stevenson had been reading the night before, for the extravagances of this dream-story are evidently based upon some curious scientific researches.

However strange to ordinary experience the mysterious transformations of the hero may be, they have undoubted parallels in fact. Read, for example, the extraordinary history told by Mr. Myers in the Transactions of the Society for Psychical Research for December, 1888, about the experiences of the French hypnotists at Havre and Nancy. Quite as inexplicable as the metamorphosis of Dr. Jekyll, is the case of the charcoal burner's wife there recorded. She has been under close supervision for several years, and her character, both when awake and when in the somnambulic state, is very familiar to the three French physicians who have specially studied her. She has three personalities. In her waking state she goes by the name of Léonie. In her first, and what we may call her superficial, trance state, produced by a few passes, she calls herself Léontine, and Léontine has a great contempt for Léonie. Léonie is a shy and stolid peasant, Léontine a vivacious intelligent woman. She entirely repudiates all responsibility for Léonie. "That good woman is not I," she says, "she is too stupid." In her deeper trance state she calls herself Léonore, and Léonore has as much contempt for Léontine as Léontine has for Léonie. Léonore has the intelligence of Léontine without her excitability and frivolity. She remonstrates with Léontine

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for her levities, and will take no responsibility for her follies. There are many other well authenticated instances of this kind of multiple existence not less curious than that of Dr. Jekyll and Mr. Hyde, beside the records of which Mr. Stevenson's fiction does not appear very extraordinary. And with regard to the remarkable coincidences and surprises of detail which characterise this and others of Mr. Stevenson's tales, here is a curious story which further illustrates the point that truth is stranger than his fiction. This is the story :—

"Shortly after Mr. Stevenson published his curious psychological story of transformation, a certain Mr. Hyde was in the North of London, and being anxious to get to a certain railway station, he took what he thought was a short cut, lost his way, and found himself in a network of mean, evil looking streets. Feeling rather nervous, he was walking extremely fast, when suddenly out of an archway ran a child right between his legs. The child fell on the pavement, he tripped over it, and trampled upon it. Being of course very much frightened, and not a little hurt, it began to scream, and in a few seconds the whole street was full of rough people who kept pouring out of the houses like ants. They surrounded him and asked him his name. He was just about to give it, when he suddenly remembered the opening incident in Mr. Stevenson's story. He was so filled with horror at having realized in his own person that terrible scene and at having done accidentally what the Mr. Hyde of fiction had done with deliberate intent, that he ran away as fast as he could go. He was, however, very closely followed, and he finally took refuge in a surgery, the door of which happened to be opened, where he explained to a young man, apparently an assistant, who happened to be there, exactly what had occurred. The crowd was induced to go away on his giving them a small sum of money, and as soon as the coast was clear he left. As he passed out, the name on the brass door-plate of the surgery caught his eye. It was 'Dr. Jekyll.'"

The romance of "Prince Otto," which details with something of the hard glitter, and something also of the humour and fancy of George Meredith, the squabbles of a little German princeling with his wife and Court, is the most polished, and perhaps one of the least successful of Mr. Stevenson's writings. But it contains one episode which is to my mind the most delightful thing he ever wrote, I mean the episode of the poor little Princess wandering through the night in the forest of pines, and in that, her first contact with the solemnities of Nature, finding her soul. There are few passages in the literature of the present day so thoroughly in touch with its most characteristic emotions. I can only at the moment recall as a parallel to this charming idyll, the development of soul in the hero of Count Tolstoï's "Cossacks," under the influence of the woods and mountains of the Caucasus.

Mr. Stevenson has not attempted any other romance in the vein of "Prince Otto." Hitherto the thirst for adventure, and perhaps also the thirst for popularity, have invited him towards a more exciting kind of fiction. Of his works in this kind "The Black Arrow," a tale of the

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Wars of the Two Roses, is the first and the worst. Yet one may imagine that it was received with great delight by the readers of the boys' journal in which it first appeared, for its most obvious quality is that breezy directness of style and thought which schoolboys know how to value. The next two tales of adventure, "Treasure Island" and "Kidnapped," though like the "Black Arrow" in some outward points, do not really belong to the same order. They are not boys' books, that is they were not primarily designed to catch the appetite of the young. On the contrary, they contain studies of character and reflections of life which are proper food for the mature palate. Especially is this true of "Kidnapped," which, as a study of Scotch character and a picture of Scotch life and scenery, shows a power of insight which it would be difficult to match outside the novels of Scott. And the true hero and Ulysses of the story, the Jacobite, Alan Breck Stuart, is one of the very few characters in the works of contemporary novelists already promising to become classical.

Mr. Stevenson's latest romance "The Master of Ballantrae," is hardly of the same order as "Kidnapped." It is a most powerful and sombre tragedy of passion and crime, turning upon the not uncommon motive of two brothers being in love with the same woman. Now it is one of the limitations of Mr. Stevenson's genius that he cannot create a living and lovable woman. Hitherto he has recognised this limitation, and has introduced scarcely any women into his stories, and only used the passion of love once, with a kind of hard psychological method, in "Prince Otto." The portrait of the woman in the "Master of Ballantrae" is very carefully drawn, as she is the central figure of the plot, but the cunning strokes are all too obviously laid on from the outside; and, with a Helen who entirely fails to move us, the whole of this Trojan war falls somewhat flat.

IV.

But it is time to turn to that department of his many-sided work, in which Mr. Stevenson is generally thought to excel. It is in his essays and poems that his charm of style is most telling. Besides his contributions to American and other reviews, he has published three books of essays, "Memories and Portraits," "Virginibus Puerisque," and "Men and Books." The first of these is, as the name suggests, in the main autobiographical; and it is characteristic of Mr. Stevenson's frank egotism that the autobiography came in half unconsciously. "I had no *design* to be autobiographical: I was but led away by the charm of beloved memories, and by regret for the irrevocable dead; and when my own young face (which is a face of the dead also) began to appear in the well as by a kind of magic, I was the first to be surprised at the occurrence. My grandfather, the pious child, my father, the idle, eager, sentimental youth, I have thus unconsciously exposed. Of their descendant, the person of to-day, I wish to keep the secret: not because I love him better, but because, with him, I am still in a business partnership, and cannot divide interests."

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Besides the memories of his young life, this volume contains one of Mr. Stevenson's most shrewd and humorous essays, "On the Character of Dogs." The friendship between men and dogs has its root, the writer suggests, in their common devotion to an elaborate and mysterious etiquette. "It is their bond of sympathy that both are the children of convention." For the inimitable way in which this sentiment is worked out and exemplified, I must refer those who do not know it to the essay itself.

To pass on to the other volumes. "Virginibus Puerisque" is concerned with the changing habits and fashions of the growing mind, and mainly with the first impressions of childhood and the sentiment of youth—the subject which in a more personal form had engaged him in "Memories and Portraits," and which is never far from his pen. For no one, not even the late Mrs. Ewing, has written more sympathetically about the young, or with keener insight entered into the mind of childhood. I do not know of any more wonderfully appreciative representation of the child's world than the "Child's Garden of Verse," a book which should be learnt by heart in every nursery. It is probably too much to expect of a nurse, but at least every mother ought also to ponder and digest the little sermon on "Child's Play" in this volume, "Virginibus Puerisque," where Mr. Stevenson enunciates the great truism so continually overlooked, that *children are not the contemporaries of their parents*—they dwell in a mythological epoch. "Making believe" is the gist of their whole lives. "What can they think," he asks, "of their parents? What can they make of these bearded or petticoated giants who look down upon their games? who move upon a cloudy Olympus, following unknown designs apart from rational enjoyment." . . . "Oh why, I remember passionately wondering, why can we not all be happy and devote ourselves to play?" One of Mr. Stevenson's conclusions is that whatever we are to expect at the hands of children, it should not be any peddling exactitude about matters of fact. "They walk in a vain show, and among mists and rainbows; they are passionate after dreams and unconcerned about realities; speech is a difficult art not wholly learned; and there is nothing in their own tastes or purposes to teach them what we mean by abstract truthfulness. . . . . Let a stockbroker be dead stupid about poetry, or a poet inexact in the details of business, and we excuse them heartily from blame. But show us a miserable, unbreeched human entity, whose whole profession is to take a tub for a fortified town, and a shaving-brush for the deadly stiletto, and who passes three-fourths of his time in a dream and the rest in open self-deception, and we expect him to be as nice upon a matter of fact as a scientific expert bearing evidence. Upon my heart, I think it less than decent. You do not consider how little the child sees, or how swift he is to weave what he has seen into bewildering fiction; and that he cares no more for what you call truth than you for a gingerbread dragoon. . . . . It would be easy to leave them in their native cloudland where they figure so prettily,—pretty like flowers, and innocent like

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dogs. They will come out of their gardens soon enough, and have to go into offices and the witness-box. Spare them yet a while, O conscientious parent! Let them doze among their playthings yet a little! for who knows what a rough, warfaring existence lies before them in the future?"

The poems of Mr. Stevenson were a year or two ago collected by him in a volume, for which he took from Ben Jonson the happy title "Underwoods":—

> "Of all my verse, like not a single line
> But like my title, for it is not mine.
> That title from a better man I stole:
> Ah, how much better, had I stol'n the whole!"

The book is dedicated to the multitude of doctors who in many different places of the earth have attended him, no fewer than eleven being mentioned by name with especial gratitude for their skill and kindness. The poems appear to have been written at long intervals. They have almost all been called forth by some special occasion, spontaneously drawn out of the fulness of his heart by some extraordinary rise in the tide of life. Many of them were inspired by that impressive sojourn in the mountains of the Cevennes, others by the jubilant voyage in Belgium, others by the visits of friends, or the reading of books which stirred and broke the monotony of the sick chamber. Their modest aim is expressed in the title, and further in these lines. :—

> "Sing clearlier, Muse, or evermore be still,
> Sing truer or no longer sing!
> No more the voice of melancholy Jacques
> To wake a weeping echo in the hill;
> But as the boy, the pirate of the spring,
> From the green elm a living linnet takes,
> One natural verse recapture, then be still."

Here is one specimen of Mr. Stevenson's attempts to recapture a natural verse in this green undergrowth of poetry.

THE HOUSE BEAUTIFUL.

> "*A naked house, a naked moor,*
> *A shivering pool before the door,*
> *A garden bare of flowers and fruit,*
> *And poplars at the garden foot—*
> *Such is the place that I live in,*
> *Bleak without and bare within.*
>
> Yet shall your ragged moor receive
> The incomparable pomp of eve,
> And the cold glories of the dawn
> Behind your shivering trees be drawn;
> And when the wind from place to place
> Doth the unmoored cloud-galleons chase
> Your garden gloom and gleam again,
> With leaping sun, with glancing rain,

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Here shall the wizard moon ascend
The heavens, in the crimson end
Of day's declining splendour; here
The army of the stars appear.
The neighbouring hollows, dry or wet,
Spring shall with tender flowers beset,
And oft the morning muser see
Larks rising from the broomy lea,
And every fairy wheel and thread
Of cobweb dew-bediamonded.
When daisies go, shall winter time
Silver the simple grass with rime;
Autumnal frosts enchant the pool,
And make the cart-ruts beautiful;
And when snow bright the moor expands,
How shall your children clap their hands!

To make this earth our hermitage,
A cheerful and a changeful page,
God's bright and intricate device
Of days and seasons doth suffice."

I have not had time to mention many of Mr. Stevenson's books—I have said nothing about that collection of stories which resembles more than any English story-book the "Twice Told Tales" of Nathaniel Hawthorne, the collection, I mean, which contains "The Merry Men," "Thrawn Janet," "Will o' the Mill," "The Treasure of Franchard." I have said nothing about the valuable literary criticisms collected under the title of "Men and Books"; nor about Mr. Stevenson's versatile contributions to the English and American press. Other publications of Mr. Stevenson, which I have only space to enumerate, are "Edinburgh: Picturesque Notes"; "The Wrong Box" (written in conjunction with Lloyd Osbourne); a collection of original Ballads founded chiefly upon traditions of the South Sea Islands; "Father Damien; an open letter,"—a pamphlet, the scathing irony of which may fitly be compared with the attack of Junius on the Duke of Grafton—; "The South Seas. Records of Three Cruises," now being published in the weekly illustrated newspaper "Black and White"; the life of Fleeming Jenkin, the Scotch Engineer, which is a model of terse and sympathetic biography; and finally "Beau Austin," written in collaboration and produced last year at the Haymarket Theatre in London, a play which not unworthily revived on the English stage, after too long neglect, the literary traditions of Goldsmith and Sheridan. It is one of the most delightful of the many delightful things by which Mr. Stevenson has earned our gratitude. It is pleasant to learn that among the Islands of the Pacific he is fast regaining that health and strength which our own climate failed to give him. Let us hope that he may for many a year continue to send Eastward, from those summer isles of Eden to our inhospitable coast, the rich results of his mature taste and scholarship, his keen thirst for life, his clear imagination, and the peculiar charm of his humour.

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RECENT GEOLOGICAL NOTES.

By J. D. Paul, F.G.S. (Read before Section "E.")

The attention of the members of this Section has more than once been directed to the well-known section of drift in the sand pit near the Leicester Abbey. The importance of this exposure has been recently greatly increased by the decision of the Corporation to use the neighbouring hill, called the Beaumont Leys, as a sewage farm. The possibility of successfully using the surface of the hill for this purpose depends upon the nature of its subsoil and its geological structure, and an examination of the exposure in the sand pit will give us the key to these problems. We have now watched the excavation of this sand pit for several years, and it has throughout that time presented a section uniform in its mean features. First, at the bottom of the section, we have the floor of Triassic marl, and resting upon this is a bed of sand about 20 feet thick, obviously laid down when the valley was occupied by a shallow tidal sea, above whose surface the forest hills appeared as so many islands. We have the traces of decayed masses of seaweed, and fragments of Keuper embedded in it. Lying upon the top of this sand is an immense mass of very tough clay, presenting just the same features as we find in half a dozen other well-known exposures of drift on the other side of the valley, which we have carefully measured and described. Our descriptions and explanations of what we have seen at the Countesthorpe brickyard, and at the Aylestone sand pit, apply without any modification here. The lower part of the clay lying immediately on the sand contains well-rounded stones of materials which are to be found now only to the north and west, and above this, with a clay between the two, partaking more or less of the character of both, comes another tough clay stuffed with pieces of chalk, *gryphæa*, ironstone, and other materials, which must equally have come from the east. The explanation of these differences between the upper and lower clays is, that one was laid down in a sea by a current from the north and west, and that at a later period the current changed to the east and deposited the upper clay. Now I must ask you to note another feature. These beds of sand and clay are not banked up against a slope on this side of the valley, but the sand runs under the hill in a more or less continuously level bed, and the hill is formed by the thickening of the beds of clay lying upon the sand. We may easily satisfy ourselves of this by tracing the bed of sand cropping out wherever, by natural or artificial means, the top clay has been cut through. The sand, for instance, was exposed and worked for many years in the cutting on the Leicester and Swannington railway at the Leicester end of the tunnel. In a well at Mr. Swift Taylor's house—Leicester Frith—the sand was

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found on a level with that in the Abbey Land sand pit, beneath a mass of dry impervious clay 90 feet in thickness. Then going up the valley the sand may be detected cropping out at the foot of the hill by the site of the S. John's Stone, and along both sides of the brook which runs by Beaumont Leys down to the old Belgrave Mill.

Some six or seven years ago it became evident that the treatment of the sewage of the borough at the old sewage works by the lime process and otherwise was so unsatisfactory, that the discovery and adoption of some better process could no longer be postponed. Finally, the Corporation decided to convert the top of the hill near Beaumont Leys into a sewage farm, in other words, to use the land as an immense filter through which the sewage should be passed, in the hope that it would issue from it in a harmless condition.

It may be remarked in passing that one of the reasons in favour of the site was the absence of villages and the very few dwellings within the area, a circumstance doubtless owing to the want of springs and water supply. Anyone who will take the trouble to examine the map of Leicestershire and Rutland will find the site of a very large proportion of the villages is fixed by the presence of a spring or a water supply. Years ago Professor Prestwich pointed out how the earliest settlements in and around London were dependent upon the subsoil. The impervious London clay, which was destitute of springs, was not built upon till the New River and other waterworks did away with the necessity of wells, and the clay districts of Holloway, Camden Town, Regent's Park, St. John's Wood, &c., received town populations much later than Stepney, Hackney, Islington, Paddington, and other places situate on the gravel. Around Harrow, which stands on the Bagshot Sand, a large area of bare London clay extends, which is still remarkably free from houses.

It will be readily seen, therefore, that this absence of springs, and the consequent absence of dwellings, were the result of the geological structure of the hill, which made it totally incapable of acting as filter, and therefore an improper site for a sewage farm. However, notwithstanding that this was publicly explained at the Congress of the Sanitary Institute of Great Britain, which was held in Leicester in 1885, the Corporation resolved to persevere, and thousands of pounds have been spent in distributing the sewage over the surface of a hill composed of 70 feet of tough glacial clay—a sort of natural solidified puddle—which never has and never will allow water or sewage to percolate through it. The danger that this unfortunate experiment would be suddenly stopped by an injunction from the Court of Chancery appeared to me to be so great that some weeks ago I took the hazardous step of calling the attention of the authorities to the bed of sand at the foot of the hill, of the existence of which they had previously been unaware, and urging upon them that the course most likely to avoid failure would be to run the sewage into this bed of sand, which would certainly allow a considerable quantity to pass through it. I believe this course has been to some extent adopted, and I can only hope that it may be successful. It

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is easy to see where difficulties may be encountered in carrying out this suggestion. The tidal water which scoured out the Soar valley cut its course through the sand, and as it thus undermined the clay of the hill above, the clay fell into the valley and mixed with the sand. In places we should expect to find the thickness of the bed of sand varying, and in other places the entire thickness may have been washed away before the superincumbent clay was deposited, but where the sand can be found it will undoubtedly provide a very useful filtering material.

More than once when I have visited the Abbey Land sand pit the workmen have called my attention to a peculiarity in the bed of sand which gives them a good deal of trouble. The floor of the bed of sand for a foot thick has been converted into a compact sandstone, and from this floor here and there rise up roundish pillars of the same sandstone, from two to three feet in diameter, and about eight feet high. The workmen are obliged to break up the floor and pillars and throw them on one side. A glance at one of these pillars will convince anyone that they neither preceded the deposition of the sand, nor were they intruded into it. The streaks of carbonaceous matter which occur plentifully in the sand, and the lines of current bedding both run continuously through the sand and the pillars. A chemical examination of the cementing material of the sandstone, and other facts connected with it, all support the theory that the pillars and floor of sandstone were formed by the percolation of water charged with carbonate of lime, oxide of iron, and a little alumina, which cemented together the grains of sand. There is no trace of borax or any other cementing material.

The occurrence of these sandstone pillars is interesting because within a stone's throw of the pit, in the centre of a hollow just such as would be made by the removal of the sand, and upon a floor of sandstone, answering exactly to that in the pit, stood the old sandstone pillar called the Saint John's Stone. Anyone who will take the trouble to examine the drawing of the stone in Nichols' "History of Leicestershire," or, better still, the sketch by Mr. Flower in Kelly's "Royal Progresses and Visits to Leicester," will see at once that the Saint John's Stone was one of these sandstone pillars whose formation and occurrence in the adjoining sand pit we have been describing.

Considering the number of instances of contact in the Forest district, between eruptive and other rocks, the occurrence of metallic ores is much less frequent than might have been expected. We meet in several places in syenite, and in the carboniferous rocks, with cubic crystals of iron pyrites, and at Mount Sorrel with hœmatite. The name of a field near the Forest Rock Inn—Tin Meadow—is supposed to be connected with the presence of grains of tin in the neighbouring brook. Then we have in the Museum a specimen of galena, the sulphide of lead, from Dimminsdale, and I have upon the table a piece of lead ore taken from a vein in the white sandstone of the Keuper [f5], near the Whitehorse Wood on the railway between Ashby and Loughborough.

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We are now able to add to this very scanty catalogue an instance of the occurrence of copper in the form of tolerably pure metal, and of oxide and carbonate in a very restricted patch at Messrs. Ellis and Everard's Bardon Hill Quarry. The ore extended over only a few square feet, and has now been completely worked out. It was not in the form of a vein, but had rather the appearance of having filled up a vacant space in a joint of the rock dipping about 50 degrees from E. to W. Subsequently the joint would appear to have been a channel along which water had percolated, and so converted the copper into an oxide and carbonate, decomposing the adjacent highly altered greenish rock. In the kernels of the lumps of ore there was sufficient pure copper left to make a flexible string of metal connecting the lumps of ore together. There was nothing connected with it to indicate the source from which the native copper was derived, or the means by which it was introduced into the cavity.

The Corporation has made a boring to the depth of two hundred feet at the new baths in Vestry Street, Humberstone Gate. It presents no new feature. It is sunk in the Upper Keuper Marls, but does not nearly penetrate them. The water supply is of the usual character in these beds, and the yield is estimated to be about 80,000 gallons a day, with 170 grains of solids per gallon, mostly calcium sulphate.

Section of Strata passed through by a 7¼-inch Boring at the Corporation Baths, Vestry Street, Leicester, November 27th, 1890 :—

	FEET.	INCHES.
Dug well (from Basement floor)	30	0
Red Marl and Stones	3	0
Red Marl	15	0
Block Marl and beds of Soft Marl	6	0
Red Block Marl, with beds of Sandstone ...	9	0
Blue Marl and Layers of Stone	10	0
Blue Stone Marl and Gypsum	6	0
Blue Marl and Stone	5	0
Red Marl	7	9
Red Sandstone	1	9
Red Marl, Gypsum, and Layers of Stone ...	63	6
Blue Stone	2	9
Red Marl, Gypsum, and Stone	40	3
	200	0

Water level 17 feet below the surface.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

No Meetings of this Section have been held since the last Report.

J. M. GIMSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

June 17th.—In place of the usual Paper there were two discussions. (1) On the projected Herbarium, and (2) on the Requirements of the Section in connection with the New Council Room

(1) It was decided that the parts of the Herbarium to be entrusted to the "Receivers," should be as follows, (the numbers being those of the species contained in the Flora of Leicestershire).

1 to 155, Rev. W. G. WHITTINGHAM.

156 to 334, Mr. E. F. COOPER.

335 to 502, Mr. T. CARTER.

503 to 737, Rev. T. A. PRESTON.

738 to 888 and Cryptogams, Mr. F. T. MOTT.

Donors of specimens are requested to send with each specimen a a proper label, filled up as far as possible. The name of the specimen, though desirable, is not necessary.

(2) As regards the requirements of the Section in the New Council Room, the suggestions of the Sub-Committee were adopted. It was also considered desirable that a "Loan Book" be provided, for the entry of the names of those who take out any periodicals after they have been the round of the Society, as well as the names of the Periodicals so taken out.

EXCURSION.—Only one attended the Excursion to Braunstone, the weather being unfavourable; nothing particular was noted.

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It was decided that no Paper be provided for the next Meeting, but that the time be devoted to the discussion of any questions which might be asked by the members.

July 15th.—Notes and Questions.—Mr. MOTT read a notice from the Caradoc Club, informing the members that the Club had started a "Book for Facts," in which were to be recorded any *facts* which might come under the notice of any members, certified by the names of such members. The facts were to be recorded as shortly as possible. The plan was approved of by the members, but no action was taken to start one on the same lines for Section "D."

Mr. AGAR asked, "what were the uses of the serratures to a leaf?" This gave rise to some discussion, but no conclusions were arrived at. Dr. COOPER stated that the second leaves of *Geranium sanguineum* were less divided than the first ones, which is an exception to the general rule.

Exhibitions.—Specimens of *Ranunculus hirsutus* from Wilts and Cropstone were exhibited by the CHAIRMAN. The former was remarkable for being glabrous, and the latter has not been noticed in the County for many years.

A specimen of the Fly Orchis *(Ophrys muscifera)*, from Brighton, by Dr. COOPER.

Specimens of *Trifolium repens* (viviparous), from Kent, and of *Ligustrum Nepalense*, by Miss HOTTINGER.

Roots of *Anthemis arvensis* adhering to a stick, by Mr. CARTER.

Specimen of the Common Plume Moth *(Pterophorus pentadactylus)* by Mr. MOTT.

EXCURSION.—The Excursion to Swannington Bog had to be abandoned on account of the wet.

No Meeting was held in August.

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

June 8th.—Mr. T. PALMER, of Knighton Drive, Aylestone Park, was elected an Associate of the Section.

Mr. J. D. PAUL, F.G.S., read a very interesting Paper—"Recent Geological Notes"—(printed on page 405).

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Messrs. J. PALMER, T. BURROWS, E. PATTISON and the Chairman took part in the discussion which followed, after which a vote of thanks was unanimously accorded to the LECTURER.

The CHAIRMAN afterwards called attention to the desirability of securing good photographs of interesting exposures in the district. He also gave a short account of a Section recently made near the Humberstone Road (Vulcan Road and Spinney Hills), and commented upon the relations of the Triassic beds exposed, illustrating his remarks by maps and sketches, shortly to be published.

Excursions.—A provisional list of Excursions was submitted to the Meeting, and the Secretary was instructed to issue a circular giving definite dates and information.

Exhibits.—Lead Ore from near Loughborough, and Copper Ore from Messrs. Ellis & Everard's Quarry, Bardon Hill—by Mr. J. D. PAUL, F.G.S.

June 20th.—Excursion to Enderby.

After a pleasant walk through the meadows, Enderby was reached in time for tea. Afterwards the party inspected the Quarries, which were much admired.

The return walk through Lubbesthorpe led past the Priory Farm, and here the party were very kindly welcomed by Mr. and Mrs. TURNER who, in addition to providing refreshments, pointed out the few existing remains of the old Abbey. These consisted of a portion of the old and very thick wall, and one or two sculptured stone blocks. The site of the moat which surrounded the Abbey was also plainly discernible, and it was stated that recent excavations showed the bottom to have been paved with stones laid loosely without cement. The situation of the burial ground had also been determined, some portions of skeletons having been disinterred therefrom.

In water collected from various streams and ditches on the way the following occurred, more or less abundantly: *Difflugia globulosa*, *Actinophrys sol*, *Epistylis* sp., *Vaginicola crystallina*, *Vaginicola globosa*, *Stylonichia mytilus*, *Aspidisca costata*, *Chydorus*, and numerous other common forms.

June 27th—Excursion to Narborough Bogs.

On arriving at the Bogs the party separated. Those who paid a visit to the Mill were fortunate enough to see a case of Otters *(Lutra vulgaris)* obtained recently from the River in the vicinity of the Mill. The CHAIRMAN was also enabled to make arrangements for securing some of the animals—several of which are known to be still in the locality—to fill the gap which at present exists in the Museum collection of Leicestershire Mammalia.

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The Bogs were chiefly noticeable for a profuse display of flowers. In the short time devoted to the collection of these, the following species were recorded, viz:—*Thalictrum flavum; Ranunculus sceleratus; R. acris; Caltha Palustris* (in fruit) *Cardamine pratensis; Lychnis flos-cuculi; Stellaria holostea; Geranium pratense; Spiræa ulmaria; Viburnum opulus; Senecio aquaticus; Chrysanthemum leucanthemum; Myosotis palustris; Rhinanthus crista-galli; Callitriche verna; Iris pseud-acorus: Orchis mascula*; *O. maculata* (one specimen bearing white flowers). The Section is indebted to Mr. G. H. STORER for his kindness in examining many of the plants mentioned.

The ditches were not in good condition for obtaining specimens of microscopic life, owing to the recent heavy rains. It may, however, be mentioned that several colonies of the curious sociable monad, *Anthophysa vegetans*, were met with, as also a few examples of the handsome Rhizopod, *Difflugia corona.*

Tea was very kindly provided by the Misses BARBER at their house in Narborough, and to those ladies the members are indebted for a very enjoyable excursion.

July 6th.—Mr. HAROLD LITTLEDALE, of the College, Baroda, gave an Address entitled, "Notes on Indian Shikar."

In his introductory remarks the lecturer stated that, as it was proposed to erect a Museum at Baroda, his journey to England had been undertaken for the purpose of visiting English Museums, in order to inspect and compare the systems of arrangement in use. He spoke in the highest terms of the Leicester Museum, saying that he considered the plan pursued in the arrangement of the Collections realised the *beau ideal* of how such a task should be performed.

After this digression Mr. LITTLEDALE proceeded to give a vivid description of his experiences with big game in India.

For sport of that description India stood pre-eminent, as opportunities were offered for hunting with the Rifle, Spear, Dog, Hunting Leopard, Lynx, and Hawk. It was, too, the poor man's paradise, the expense entailed being slight, while the animals haunting mountains, forest, jungle, and uncultivated plains, were alike accessible to the sportsman. The difficulties which had to be faced in shooting over such varied ground were graphically described. In the plains the want of cover was a serious drawback and entailed hard work, while on precipitous ground the dangers from avalanches and other evils incidental to mountain climbing, rendered the pursuit of Ibex and Markhoor more risky work than Tiger shooting. Regarding the latter, the lecturer had many personal experiences to relate, having killed as many as five Tigers in twenty days, although it was five years before he got his first shot at a Tiger.

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Describing some of the animals which he had himself hunted, Mr. LITTLEDALE divided them into those inhabiting the plains, the jungle, and the hills. On the plains one of the most characteristic animals was the Black Buck *(Antelope cervicapra)* which occurred in enormous numbers, it being no unusual sight, in certain districts, to pass within a short distance of them when travelling by rail. The experiences of amateurs when shooting the Buck were related in an amusing manner, and attention was called to the habit possessed by this animal of taking several preliminary bounds upwards before finally taking to flight. The Nylghaie Antelope *(Boselaphus pictus)*—which was often hunted by riding it down with a revolver—also occurred, as did the Gazelle *(Gazella bennetti)* which was difficult to obtain, owing to its shy habits, which rendered great care necessary in getting within proper range. Another species *(Gazella subgutterosa)* occurred in Cabul. Jackals, Wolves, and the Wild Dog were all familiar to the hunter on the plains; and the Wolves enjoyed the unenviable reputation of child stealers, many cases being on record in which native children had been seized by Wolves during the absence of their parents. In speaking of the Hyæna *(Hyæna striata)* Mr. LITTLEDALE related one of his first experiences with this animal, which he only secured after despatching it in a cave to which it had retired for shelter. He was eventually pulled out, feet foremost, by his companions, with the dead Hyæna in his grasp.

In the jungle was found the most beautiful Indian Deer *(Axis maculata)*, and the finest Indian Stag—the Sambur *(Cervus aristotelis)*, which stood 11 or 12 hands high, and possessed 36 or 40 inch horns. In addition to these, the Barking Deer *(Cervulus muntjac)*, the four horned Deer *(Tetraceros)*, and the Mouse Deer, were met with. Another characteristic jungle animal was the Wild Buffalo, which afforded good sport, and in thin hilly jungle the Sloth Bear *(Ursus labiatus)*, could often be obtained.

Mr. LITTLEDALE'S account of Ibex and Markhoor shooting in the Himalayas was specially interesting. These animals were found at altitudes varying from 10,000 to 20,000 feet, and could only be obtained by perseverance in the face of many dangers and obstacles. Of the Markhoor *(Capra megaceros)*, a splendid animal which is becoming increasingly rare, he obtained ten examples, and Ibex had also fallen to his gun, with 45 inch horns—the maximum development being about 52 inches. Various species of Sheep also occurred, as the magnificent *Ovis poli*, which the lecturer had not yet met with, *Ovis ammon*, *Ovis cycloceros*, &c. The Chamois was found commonly in the Himalayas, and Hodgson's Antelope could be shot at elevations of 20,000 feet. Amongst the other mountain animals described were the Snow Leopard, Sikkim Stag, and Musk Deer *(Moschus moschiferus)*, with its tusks about five inches in length.

In concluding, mention was made of the Elephant, which occurred in

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Mysore and Chittagong; the Hog Deer *(Cervus porcinus)* inhabiting Sind, and the Rhinoceros.

In the discussion, the CHAIRMAN asked whether Mr. LITTLEDALE was acquainted with any authentic instances of children having been brought up by Wolves, as authoritatively stated in an article in a recent number of the *Cornhill Magazine?*

Mr. LITTLEDALE stated in reply, that cases of Wolves suckling children had been proved beyond dispute. It had also been noted that children so reared would not eat cooked food, but only raw meat.

A vote of thanks was then proposed by Dr. POPE. Dr. MACAULAY, in seconding, mentioned that the lecturer possessed an album containing photographs of his hunting experiences, and asked whether Mr. LITTLEDALE would leave it at the Museum for a short time, to enable members to examine the views?

Mr. LITTLEDALE, in returning thanks, said he should be pleased to send his album for the inspection of members interested in the subject. He also gave a description of the method of hunting Antelope with a Cheetah, an animal which he had neglected to mention previously.

MONTAGU BROWNE, *Chairman.*

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Announcements.

GENERAL MEETINGS.

1891.

Oct. 5.—The PRESIDENT.—Inaugural Address.

„ 19.—Rev. AUGUSTUS JESSOPP, D.D.—"The Religious Houses of Leicester."

Nov. 2.—The Right Rev. the BISHOP OF PETERBOROUGH.—"Sicily."

„ 16.—Sir R. S. BALL (Royal Astronomer of Ireland).—"Invisible Stars."

„ 30.—J. D. PAUL, F.Z.S., F.G.S.—"The Ruins in Bradgate Park: their History and Associations. (With Lantern Illustrations).

Dec. 14.—Miss AMELIA B. EDWARDS.—"The Art of the Novelist."

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. J. M. GIMSON, 100, New Walk.

Secretary—Mr. F. S. HERNE, Llanrwst, 49, Mere Road.

Oct. 20.—The CHAIRMAN.—"An Edinburgh Review Editor, and his Contributors."

Nov. 17.—Mr. A. H. BENNETT, LL.B.—"An English Village in the 13th Century."

Dec. 15.—Mr. F. S. HERNE—"Two Old Libraries of Leicester."

J. M. GIMSON, *Chairman.*

SECTION "D."

Chairman—Rev. T. A. PRESTON, Thurcaston, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Highfields, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at the Museum, at 7 p.m.

1891.

Oct. 21.—(1) Exhibition of Fungi.
(2) Report on the Progress of the Herbarium.
(3) Paper on "A Ramble in the Abbey Park," by Miss HOTTINGER.
(4) Study of the Order, Carnivora.
(5) Microscope—Spores of Fungi.

Nov. 18.—(1) Exhibition of Vegetable Fibres.
(2) Report on the Herbarium.
(3) Paper on "The Mental Capacity of Animals," by Mr. MOTT.
(4) Study of the Order, Ranunculaceae.
(5) Microscope—Vegetable Fibres.

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Dec. 16.—(1) Exhibition of Cereals.
(2) Report on the Herbarium.
(3) Paper
(4) Study of the Order, Insectivora.
(5) Microscope—Starches.

Rev. T. A. PRESTON, *Chairman.*

SECTION "E."

Chairman—MONTAGU BROWNE, F.Z.S., F.G.S., Town Museum.

Vice-Chairman—Dr. F. M. POPE, Prebend Street.

Secretary—F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

Oct. 12.—Paper by Mr. G. WARD: "The Physical and Chemical Characters of Wool and Hair." (Illustrated.)

Wednesday, Nov. 11.—Paper by the CHAIRMAN: "Notes on the Present and Past Immigrations of the Grey Phalarope (*Phalaropus fulicarius*, L) to the Shores of Britain." (Illustrated by Specimens.)

Dec. 7.—Paper by the SECRETARY: "Cell formation." (Illustrated.)

MONTAGU BROWNE, *Chairman.*

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TRANSACTIONS

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Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1891-92.

OCTOBER TO DECEMBER, 1891.

GENERAL MEETINGS.

October 5th, 1891.—Inaugural Address of the President (R. HARVEY, Esq., LL.B.).

IN his opening remarks, the PRESIDENT said he had to congratulate the Society on starting the fifty-sixth year of its existence in what he believed to be a thoroughly sound, vigorous, and healthy condition. Whether they regarded the number of members, which seemed to be steadily increasing, or the attendances at the fortnightly meetings, or the active work which had been effected at the various sections of the Society, or the "Quarterly Transactions," which were growing steadily —not only in quantity but also in quality—he thought they must consider that the Society stood as well to-day as at any time within living memory. The work the Society was doing was a complete answer to those gentlemen who complained that it was not doing anything for the town. A great deal of the work was done in the background, and the only tangible proof of it was in the "Transactions," and people would do well to read them before making their complaints. Another subject for congratulation was the fact that the Society was this year enlarging its borders. They were having a much more commodious and convenient council-room erected for them, and in a short time they would be restored to their ancient privileges with regard to the full, unimpeded, and uninterrupted use of the lecture-room after the various cases had been removed to the other rooms.

Proceeding with his address, Mr. Harvey said the subject was one which, if somewhat trite, had, at any rate, an interest in some degree for almost every member of a civilised community. Few were the persons, of whatever age or nation, who, in some department and in some measure, did not fall within the category of lovers of art, and more particularly of that branch of art which was distinguished by the term plastic. It was to the plastic arts, and more especially to the art of painting in its relation to nature, that he wished to draw the attention of his audience, and he should endeavour to set forth and illustrate some of the leading principles and rules which experience told them the artist was bound to conform to if he desired to produce a thing of beauty that should not only please for the moment but be a joy for ever. He would state his views in no dogmatic spirit, recognising most fully that on such a subject everyone

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was entitled to his own opinion. It would perhaps clear the ground if they had some definition of the essential ideas underlying the expressions Art, Artistic, Work of Art, as commonly used in modern times. In its original signification the word Art meant no more than skill in manual operations, and especially that kind of skill which was improved by practice. Then the word was extended to cover operations of a mental kind as opposed to the strictly manual. In the course of time a distinction obtained between the arts which ministered to the outward wants and those which provided intellectual or emotional pleasure. The latter, therefore, required a skill grounded on special advantages of organisation and temperament, which were only met with in the requisite degree in comparatively rare instances. It was frequently stated in broad terms that the province of art was the beautiful, but unless the word beauty was taken in a wider sense than was generally accepted, the statement would seem to be too narrow and to exclude many productions which were in the truest sense works of art. The emotions of the human mind were so woven together that the beautiful appeared to shade off, by imperceptible degrees, on the one side through the sublime into the repulsive, and on the other by way of the comic into the contemptible. Between those two extremes, limited by a fluctuating border as to the exact position of which tastes would always differ, lay the proper field of art. Here, as in other departments of life and thought, safety lay in a middle course, and the artist who ventured too near the confines had only himself to thank if he fell into the bog on the one side or the quagmire on the other. As practised by the painter, art was based upon imitation, on the reproduction of external visible objects. But the faculty of exciting, by means of a few ochres and oxides spread upon a square yard of canvas, sensations which were approximately the same as those produced by solid external nature, was not the art; it was only the language of the art, and was to be acquired, not as an end in itself, but as a vehicle of higher purposes. Mere servile imitation was the very childhood of art, and the admiration of it was only the harbinger of the dawn of the true art sense. There was nothing so beautiful in nature but the artist could in his imagination improve upon it. He might not be able to reproduce his ideal in all its vividness, but, if that ideal was in fact an improvement upon the natural object that suggested it, other things being equal, the portrayal of the ideal should be more pleasing than that of the original. The direct imitation of nature was certainly available in landscape painting to a greater extent than in any other branch of art, but even a landscape must be more than a mere record of the scene transcribed. Lovely as nature might be, it was rarely that she revealed herself in her truly poetical moods. This element of poetry it was the artist's business to supply. Direct imitation must therefore be inspired and warmed by memory and imagination. But previous to this idealising process there was another to which nature must submit, and which was defined as the process of elimination, by which the petty, trivial, commonplace, and

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even revolting objects found in almost every landscape were kept out. The landscape photographer had to deal with such discordant elements as best he could, but it was the privilege, as it was the duty, of the artist in colours to ignore them in his picture. There was further the process of omitting an amount of detail which was tolerated in the material object because of its manifest and necessary connection with the uses and structure of the object, but which in the painted representation simply wearied and distracted the eye. The eye, on the whole, rejoiced in broad effects, and was worried by niggling touches. An artistic whole was something different from the sum of all the parts.

Another principle which limited the exact imitation of nature was that of unity in which nature, taken in the lump, was sometimes lacking. By this he meant that in a landscape they might be pleased with the view as a whole, but the æsthetic emotion seemed unsatisfied unless there was some central dominant idea around which and in relation to which the accessories might group themselves. The painter then should endeavour to bind the scene together into what might be called an organic whole, and yet without seriously disturbing the faithfulness of the picture. If it was objected that this process was a tampering with the truths of nature, his answer was that beauty and not truth was the special aim of the painter, Fortunately, to a considerable extent, in landscape painting at least, truth and beauty were identical. Where they differed, so far as picture-making was concerned, beauty must go to the canvas and truth must go to the wall. If landscape-painting was to be qualified by idealism, selection, elimination, and a regard for unity of effect, still more was this the case with paintings in which the human interest was predominant. In figure-painting there was the utmost scope, not only for technical skill of a far higher order than that required by a landscape, but for the application of the principles already described. And if the figure painter's difficulties exceeded those of the landscape artist, his success was the more striking and his failure the more pronounced. It was desirable that the incident selected for depiction should be one already well-known to the spectator, or else that it should tell its own story. Subjects taken from history and poetry as a rule afforded greater scope to the intellect of the painter, enabling him, as it were, to commence building on a higher plane, the ground-work being already in the knowledge of the spectator. A subject that told its own story, being almost necessarily based on incidents of every-day life, ran the risk of verging on the common-place or the vulgar. The subject having been chosen, the faculty of invention was next called into play. With ordinary people the natural image of the actions and expressions of the characters in the incident was generally blurred and indistinct. But the natural talent of the artist, improved by habit and practice, would conjure up many vivid and distinct images of the same event. To evolve those mental pictures, to compare them, and select the most suitable, was to practice the faculty of invention. The placing of the figures to produce pictorial effect was the next step. In the grouping of

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men in the ordinary business of life nature did not usually seek or attain a picturesque standard. Not only was a rearrangement of the figures necessary to bring out the intellectual and moral aspects of the event, but it must be such as to convey the impression of balance and harmony.

Finally came the actual execution of the painting which was a matter of pure technicality.

In conclusion he would say that there was a double aspect to every work of art—"it blesses him that gives and him that takes." To obtain the full benefits the receiver must endeavour to appreciate the difficulties of the giver. It was certain that a correct taste could hardly be formed unless some coherent and consistent gauge or theory were framed by which to measure the works submitted to them. The taste prevailing among the cultured public must largely influence the standard of the painter. While it was for the artist to lead the public, it was for the public in its turn to encourage and stimulate, or, as occasion might require, to criticise and restrain the artist. And it was only by this healthy action and reaction that the best interests and the true progress of art could be promoted and secured.

October 19th, 1891.—Rev. Augustus Jessopp, D.D., on "The Religious Houses of Leicester."

Dr. Jessopp remarked that Leicester had been notorious for a good deal more than one hundred years for the great energy and success with which research into its history had been pursued. The question must have often come before their minds—what was the meaning of these religious houses which had existed in their midst? By religious houses he meant those in which people, who professed what in former days was supposed to be the only real religion, who gave themselves according to rule to serve God and to overcome the world, or rather to keep it at a distance, lived a common life. Monasteries or religious houses in some form or another had existed in this country for at least one thousand years, and they were brought to an end by a *coup d'etat* which, for audacity in inception, for the complete success which attended it, and for the atrocity which characterised its whole course, had no parallel in the history of the world.

Centuries before William the Conqueror's time there was a Castle at Leicester. It had suffered a good deal of disturbance, and something in the shape of ruin, and had fallen into decay; but before the Conqueror came there seemed to have been there a college of people called canons, who had certain endowments of their own and a certain chapter of their own, and who were supposed to live a common life. That took them back to the institution of the secular canons. There was a time, before the Danish invasion, when there was a bishop of Leicester. He believed that these secular canons represented the existence of the bishop in our midst, and they were really what we should now understand by the chapter of the bishop. In very old towns the bishop always had round

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him a certain number of clergy who were supposed to live according to rule, and they were called canonical clergy. When the bishopric ceased at Leicester the chances were there would be still some funds for keeping this body of clergy together, and the secular canons remained. A curious part of this Leicester history was that there were never monks here. The secular canons lived the common life, and were maintained out of the common fund. But as time went on, and sometimes the bishop disappeared or was transferred, the houses of the secular canons remained without a head, and discipline came to an end. There were seven left at Leicester, and these seven, as might have been expected when the head was removed, began to disagree. They here and in other places tired of the common life and wanted to live apart. The result was that the property was divided, and therefore these chapters became many; and before the Conquest the canons had wives, and nursemaids and perambulators could be seen going about the cloisters.

In the 10th century a great raid was made and a great disturbance raised against the married clergy. St. Dunstan, influenced a great deal by the great revival in Europe, girded against the married clergy, and especially against the secular canons. They were driven out from many places, but in others they held their own until there came a time when they had to be reformed. When Robert de Beaumont, the first Earl of Leicester, came here he found the secular canons established in the Castle, with property of their own; they were a Corporation. He restored their buildings, rebuilt their Church, attached to them certain endowments which they had before, and set them on their legs again. At Beaumont's death he left a son, Robert the Hunchback, who was justiciary to Henry I., and he amassed money largely. It would seem that the secular canons which his father had established had proved somewhat of a failure, and people had again begun to get up a strong feeling against the laxity of the religious houses of the secular canons.

The lecturer proceeded to sketch vividly the religious awakening of the eleventh century, and then described the strengthening, brought about through St. Ives, of the rules which bound the secular canons, and the revival which came about amongst them. He then turned to the foundation of the Leicester Abbey, which was the work of Robert the Hunchback. It was not an Abbey of monks. What was, it might be asked, the difference between a monk and a canon? For some time the early monks were not clergy at all. For several centuries there was a feeling against the clergy being monks. A monk retired from the wicked world and left it to take care of itself, so that he could save his own soul. But it was essential to a canon that he should be a priest or a clergyman. He was not confined in the same way as a monk to the cloister. As a priest of the sanctuary he must have duties outside. The canons, whether regular or secular, were always moving about among the people, always in theory had cure of souls, and if they drew great tithes from their deputies the vicars, they did not forget that the vicars were deputies and exacted from them certain duties. Robert, as he had

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said, founded the Abbey, which had in it twenty-six or twenty-seven canons. Years went by and they amassed wealth. He had not time to tell them how they spent their hours, day or night, but the theory was that the worship of God in their Church at the Abbey never stopped. The Abbey continued for some five hundred years, and the income at the time of the suppression really might be said to be between £20,000 and £30,000 a year. Let them imagine what that sum meant, spent in the streets of a city one twentieth of Leicester's present size—spent by men who were model landlords, no one denied that; by men who were the centres of education, light, and progress on this community. Let them think of their glorious Church, which in itself was a museum, where art was cultivated to the highest possible pitch. When the suppression came there was a set of ruffians who went out to make merchandise of the monasteries. One of them was named Leighton, whose correspondence had just been published by the Camden Society. In one of those letters he complained that he had been to Leicester, but could find nothing wrong about these canons. The people had no bad stories to tell, and the canons themselves would not confess that they were scoundrels. He reported to his lord:—"I can find no evil amongst them," but he added that on the morrow "I intend to charge divers of them with the grossest of crimes." This was the kind of man who was taken as a witness, and on whose testimony was founded the stories of the vices of monks and nuns, and who had been appealed to again and again by the histories as though he were worthy of credence—he, a liar of liars in a lying age.

Robert the Hunchback left three sons—Robert of the White Hands, Roger, and William the Leper. William founded a lazar-house here. This was another of the religious houses—a house for those who were suffering from dreadful skin diseases brought about by want of knowledge of the ordinary laws of health, want of observance of personal habits of cleanliness, by poverty, bad food, and salt meat in winter. There were two men appointed to look after this house—of course they were clergy and priests of the sanctuary. Robert of the White Hands married the Lady Petronilla, who gave her long and beautiful hair to the Leicester Abbey. It was woven into a rope, and from it hung the lamp over the altar. Henry of Knighton, Leicester's chronicler, spoke of persons in his grandfather's time who remembered having seen that rope of hair. Petronilla gave also lands to the Abbey. When the Beaumont male line failed, Simon de Montfort became Earl of Leicester, and during the reign of his house the friars movement commenced in England. These men, who established houses in Leicester, refused to hold an acre of land, and when the suppression came the plunderers, to their great disappointment, found nothing that they could take away from their houses except books, which robbers, as a rule, did not care to run away with.

The lecturer next referred to the Plantagenet earls and to their establishment, as a result of the preaching of the friars, of the hospital at Leicester. This hospital was usually spoken of as a college, and it was a college because it was governed by a college or collection of men. The

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object of the hospital was to provide a refuge or an almshouse for fifty poor men and fifty poor women who had known better days, so that they could find shelter for the remainder of their lives, and have someone to look after them. There seemed also in this institution to have been a hospital ward, and lastly a casual ward, so that the casual paupers who passed through the town might get provision for one night's lodgings. This hospital was placed under the control of the clergy—there were one dean and twelve secular clergy. They must not suppose that these were bloated monks or superstitious friars, or canons who gave themselves airs. They were simply country clergy, who he believed were the best people in the world. The hospital covered twelve acres, and it had lands in almost every shire. The twelve secular priests had each a vicar of his own. That meant twelve vicars acting as chaplains to these poor people in the hospital. There were ten nurses and six choristers, all provided out of the endowment of the Plantagenet earls. When the suppression came the income of the new work of the hospital was one hundred times the income of what used to be called St. Ursula's Hospital, which was founded a little time before, in the time of Henry VIII. From St. Ursula's Hospital he believed there were still twenty-four old people maintained, and he understood that a large portion of Leicester's education was still carried on out of the endowments. He hoped that those endowments of St. Ursula's Hospital—they might now know it by another name—might go on increasing. But let them think what might have been done if the endowments of the Plantagenets' hospital had continued in addition to St. Ursula's.

When the time of the suppression came the friars went first, the Abbey next, the secular canons next. Edward VI.'s councillors found that they, too, wanted money, and then the great new hospital, to which he had been referring, was swept off the face of the earth. The vessels were sold, the poor old people were driven out to beg their bread, the nurses were bundled out with a few shillings compensation, the secular priests were banished, and Leicester was robbed of her endowments, the consequences of which were suffered until the present day. People talked about the suppression of the monasteries as though that were all. They did not know that a system of pillage passed at that time over the whole country, when the rich plundered the poor, the strong plundered the weak. If they supposed that it was only a parcel of friars and monks who were robbed they were mistaken, because that was only a small portion of what happened. It was the poor who suffered ten times more than anyone else. Let them consider what advantages Leicester would have gained if the endowments of this hospital, of which he had been speaking, had remained to it. What would have been their poor-rates now if the college, as it was called, had remained? The clergy were paying for it in the narrowness of their incomes, and all classes in Leicester were suffering from the effects of the suppression.

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November 3rd.—The Right Rev. BISHOP of PETERBOROUGH, on "Sicily."

The Bishop said that Sicily attracted him to visit it because, of all the historic countries of Europe, Sicily was the most historic. It had the longest continuous record, and round it many of the most interesting moments of the history of civilisation and culture had gathered. From its position Sicily was naturally the meeting point of east and west. One side of the triangular island faced Africa, a second faced Greece, and the third Italy, and it naturally attracted settlers from all those countries. It had been the battlefield of varying civilisations. Every nation almost that was famous in the world's history had at some time or another been there. Every form of civilisation, all the great world religions, had had their wars in that island. First it was settled on by the Phœnicians. It was the centre to which they went on trading expeditions. Then came the Greeks, then the Carthaginians, next the Romans, after them the Franks, and Goths, and the Byzantine Empire. They were succeeded by the Normans, then the Germans, the French, and the Spaniards. The result of this constant change was that Sicily possessed historic interest beyond any other part of Europe. Wherever they turned they were brought face to face with new associations and new reminiscences.

The first people of historic importance who settled in Sicily were Phœnicians. They wanted trading stations where they might exchange their goods with the inhabitants of the interior, and it was very striking at the present day to be able to find, as he did, on one of the headlands that rose steep above the sea, still standing ruins of the Phœnician houses, built perhaps 900 years before Christ, of that solid masonry of the early times which we call Cyclopean. But the Phœnicians contributed little to the history of human progress so far as it affected us. They and their trade were supplanted by the Greeks as early as the eighth century before Christ. The Greeks, he might remind them, who sent out their colonising expeditions to Sicily, never thought of their country as a definite place. They spoke of the "Hellenic element"—they were an element of human thought, a factor of human society, rather than a people having a definite habitation. Perhaps the Greek colonies of Sicily were more interesting even than the towns in Greece itself—perhaps they enabled one better to understand the charm, beauty, and dignity of Greek life. At any rate, to him there came quite a new sense of what Greek life was when he stood on what was the Acropolis of the old Greek Akragas—the modern Girgenti. There one could see before one the remains of a Greek city, perhaps the mightiest that ever was. It was computed that it contained a population of 800,000, and the modern town comprised only about the fortieth part of what the old city enclosed within its walls. The remains of the old Greek temples revealed the simplest and most severe kind of Greek architecture. They belonged to the Dorian style—the pillars without any bases, and with the simplest and most unadorned capitals. The ruins of five temples

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still remained. One of them was almost entirely complete, and was one of the most magnificent Greek temples that remained anywhere.

The great gift of the Greeks to after ages was this, that they asserted two principles, first of all the order of the universe, and secondly that the mind of man mirrored and represented and carried forth and expresed that order which he found within himself. A great saying of the Greeks was this, that man was the measure of all things, and in the strength of that assertion of individual power, a power founded on order and finding its expression in liberty, in the assertion of those great principles the Greeks made a step forward in the development of mankind, the importance of which it was absolutely impossible to overestimate. The principles they stated and embodied both in their civic life and architecture were still the principles we looked to with the highest reverence as the very foundations of our social life. Nowhere were these principles expressed with greater prominence than at Girgenti, with the severe and solemn Dorian temples all visible to the eye of the observer as he stood in the centre of the city, their forms perfectly orderly, perfectly harmonious, with no architectural feature allowed to come into distinct prominence, destitute of ornament entirely at the bottom, adorned only with sculpture at the top in parts, where all that art could do, and that realisation could achieve, was done to set forth in simple form the triumphs of man and human skill in some shape or another.

After speaking of the power of architecture to impress men's minds, the Bishop said that every age must expect to be judged by its architecture. We should be judged in the future more by the buildings we raised than we should by all our professed emotion—all that we endeavoured to do and all that we strove to say but somehow failed to make ourselves intelligible.

The lecturer proceeded to allude to the fall of Akragas, which was besieged by the Carthaginians in 406.

After a reference to the tyrant Phalaris, the lecturer explained that Akragas fell because of its exclusiveness, and because it was not supported by its neighbours. Then Syracuse became the chief of Greek Sicilian cities. It was a city of mighty compass, and the circuit of its walls exceeded 20 miles. Now it had shrunk to one little island which formed only a part of the original town. No harbour was so attractive or so full of interest as the harbour of Syracuse. There it was that the great tragedy of the history of Greece was played. Greek life was full of division, but the great line of cleavage lay between the two branches of the race—the Dorian and the Ionian.

The lecturer went on to speak of the Peloponnesian war. The Athenians interfered in the affairs of Syracuse, and their expedition against Syracuse led to the destruction of Athens. The Spartans sent a fleet to the aid of the Syracusans, and the final battle was fought in that great harbour. Thucydides had left a description of it, unparalleled among historical descriptions of any time. His lordship gave a vivid

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account of the scene as pictured by the Greek historian, and of the rout of the Athenian ships. The Athenians withdrew to the camp and reflected how they might escape, for the sea was theirs no more. In the darkness of the night, split up into three detachments, they stole away, only to lose themselves amid the defiles of the mountains, or to be slain by the little stream at which they had made a stand, or to be brought back as captives. Seven thousand of them were thrust into the great Syracusan quarries—now turned into gardens in which every kind of strange oriental tree and creeper grew, but from which was originally taken the stone of which the city was built. Here the captives stayed for four months, and here they died, like dogs, of hunger and exposure to the weather—they, perhaps the most cultivated body of men in the world, the companions of Socrates and Alcibiades, they who had witnessed the plays of Sophocles and Euripides, knew them by heart and repeated great portions of them. The few who escaped, escaped because the Syracusans, moved with pity at hearing the lines of Euripides repeated, saved them that they might act as rhapsodists in their houses.

Great was the civilization of the Greeks, great their intellectual power. But as one stood in the quarries of Syracuse one saw how little they were touched by humanity after all, what little sense there was of that kinship of mankind. Great as the ancient world was, endowed with intellectual gifts to which modern times, in his opinion, could lay no claim, it yet was lacking in that enthusiasm, that force, that which constituted, after all, the backbone of our modern civilisation, the elements which he ventured to think had been given to mankind by Christianity, and Christianity alone. Syracuse remained the chief of Sicilian cities, but it, in its turn, fell, as the whole of Sicily fell, before the Carthaginians and Romans combined.

The bishop proceeded briefly to speak of the Punic wars, after which Sicily became part—the first distinctly organised part of the Roman possessions which had its government and rule sent from the great Imperial city. The result was the slow but steady downfall of Sicily. It was rendered subsidiary to the interests of Rome, for which it was made to contribute corn. Its land was portioned out among the great Roman landlords. It became a country of large estates, possessed by absentee landlords, regulated by middlemen, and worked by slaves. The bishop alluded to the servile wars, which arose when the slaves felt themselves strong enough to rise in rebellion, and remarked that anyone who had seen the place which the Sicilian slaves made their stronghold —Enna or Castro Giovanni—would understand how it was that they were able to hold out so long.

After a reference to Verres' administration and to Cicero and Verres, the lecturer went on to say that when the Roman Empire fell, in the period of the wanderings of the Teutonic people, the Franks and Ostro-Goths went into Sicily, but they were driven out by Belisarius, and in the sixth century after Christ, Sicily became part of the Eastern Empire. The Byzantine Empire was one to which European civilisation owed a

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debt of gratitude which was not sufficiently acknowledged. But for the stand made by the Greek Empire against barbarian invaders, Europe would probably to-day have been annexed to Asia or Africa. It erected a barrier not to be broken through by the inhabitants of either of these other continents, except that the Arabs broke through it for a time, which brought them to the next stage in the history of Sicily. The island was probably better off under the Arabs than for many centuries before.

The bishop next referred to the Norman occupation. The contrast between Sicily and England here became interesting. Both were conquered by the Normans, and the two great islands went through the same process of regeneration at the hands of the same bold, adventurous, and stubborn race, but there the parallel ceased. The Norman conquest in England infused new life into English institutions, and gave to English blood a strength and force and practical capacity it never had before, but the Norman invasion of Sicily was only short-lived. Only for 150 years did it hold its own, but during that time Sicily rose to the highest and most magnificent period of its history. It was extraordinary what the Norman kings did for Sicily. They brought it into order, kept peace on all sides, carried their victorious arms in every direction. His lordship referred particularly to Roger II., and his method of gaining the recognition of his kingship—not at the hands of the Pope, whose claimed authority he declined to receive, but by summoning a Parliament at Palermo.

A very interesting description was then given of the Norman buildings—churches and cathedrals with their wonderful mosaic work—and of the strange force and dignity they lent to the new conceptions of life to which the Norman kings gave form in these splendid works, rendering them intelligible to the meanest passer-by. It was a marvel how in so short a space of time capable men were produced who were equal to the work—how it came about that, at that moment of national aspiration, men arose to do that work. When the call came to do a really great thing, somehow or other men responded; they rose to do it. There were few expressions given with more dignity and simplicity of the spirit of Christianity than these Norman temples of Sicily.

The bishop proceeded very briefly to sketch the more modern courses of Sicilian history, to the time of its union with the kingdom of Italy. He then touched upon the personal characteristics of the Sicilian people, and related some amusing experiences which Mrs. Creighton and himself underwent in the course of their travel.

Finally came a very interesting reference, with examples, to the folk-songs of the island. Sicily had always been a land of poetry. Theocritus of Syracuse put into literary form the songs of the shepherds and herdsmen, whose poems had perhaps had a greater influence on literature —they had in England influenced Milton, Keats, and Matthew Arnold —in the way of form, style and contents, than the work of almost any other writer.

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November 16th.—Sir ROBERT BALL (Royal Astronomer of Ireland), on "Invisible Stars."

Sir ROBERT BALL said in astronomical science they were at this moment on the brink of, or rather had actually entered upon, as great a departure as was made by Galileo when he first invented the telescope. The human eye, exquisite as it no doubt was, was still not very perfect as an astronomical instrument. Eyes were given them—to put it plainly—to see the way to their mouths, in the first instance, and not—in spite of what Socrates said to the contrary—for the purpose of gazing at the heavens. Consequently the eye, even when supplemented by the telescope, did not answer all the expectations that they reasonably entertained. In the first place, the eye was not patient enough. If they looked for an object and did not see it at once there was little use in staring after it, for the eye got tired very quickly. If the impression was not made immediately, staring longer would not help it. So they wanted something that would be more patient than the eye, something which should have the power of accumulating, so to speak, the impressions that fell upon it. In another way, too, the eye was imperfect because, though it could see all the exquisite colours of the rainbow, and their infinite combinations by which came the thousand hues with which Nature was adorned, yet there were multitudes of kinds of light for which they had no name, for which they had no nerves in the eye to perceive, and these kinds of light would pass by them unheeded altogether if it were not that they got them revealed in another manner. In these two imperfections of the eye the camera had come to their service, and the way they employed it to study the heavens was as follows:—They took an exquisitely sensitive photograph plate—a plate so sensitive that an exposure of a hundredth part of a second in daylight was sufficient to print upon it—and they put it in the telescope, turned it to the heavens, and let the stars form their own images upon the plate. With nice skill they moved the telescope so as to ensure that each star should constantly be acting upon the same spot on the plate. The sensitive film on the plate was acted upon by the stars, and it was left exposed, not for seconds or minutes, but for one, two, three, four, sometimes even for eight hours. Consequently the very small stars succeeded in engraving their little impressions on the plate. What the light did was to set up small vibrations; they acted at a certain portion of the plate, and with time enough given the little shakings succeeded in shaking asunder the combination of silver and marking the plate with their impressions. When they took the plate out of the telescope, brought it into the laboratory, poured on it the re-agents, the picture began to develop. First of all the bright stars, those which were visible to the naked eye, came out upon the plate, and then appeared the stars which they could not see with their unaided eyes, but which the telescope revealed to them. As they developed further and further they saw breaking out all over the surface of the plate myriads of stars too

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faint to be seen by any human eye, but which were disclosed to them in this manner. Thus was opened a new branch of astronomy, and they called it the science of the invisible stars. But it touched also so many older branches of astronomy that it was hard to say what part of their science had not received benefit from the application of the camera.

The gas was then turned down, and the lime-light apparatus was brought into use, in order to illustrate some of the different directions in which the sensibility of the photographic plate has been made use of in modern observatories.

The lecturer explained the concerted plan for photographing the heavens agreed upon by astronomers in Congress at Paris, and said that the sky was divided into 20,000 parts, and each part was covered by a photographic plate. Having further spoken of the delicate apparatus by which the telescope, whilst the photograph is being taken, is moved to keep pace with the movement of the stars, Sir Robert next showed the Isaac Roberts telescope, and touched upon the alternative plan of photographing with the help of a reflector. Next several photographs were thrown upon the screen. The first of them showed a round sunspot, with smaller spots, as taken by the camera at Paris, and the second and third, taken at Melbourne, presented parts of the moon. Then came an ideal picture of what an astronomer would probably see if he were making his observations from the moon itself, Sir Robert pointing out that the stars would be visible in great brilliancy and in greater numbers by reason of the absence of the dimness caused by air. The relative size of the planets having been illustrated, the lecturer observed that with one exception they had not learned much up to the present by taking photographs of the planets. They were disappointing, and did not show them all the details they expected, but they still cherished hopes that they would be able to do better.

A photograph of Saturn and his rings—secured with an exposure of six minutes sixteen seconds—was exhibited, and the lecturer then turned to speak of the difficulties of discovering the very small planets among the myriads of stars. In this matter the photographic plate again came to their assistance. They distinguished the planets by their different movements, and the plate revealed them because the different motion of the planet caused it to make a slur upon the plate compared with the distinct impression given by the stars.

The lecturer then turned to describe the interesting discovery made recently concerning the star Algol. The stars were regarded by the ancients as deities, or the eyes of deities, who looked down upon the earth and influenced the fortunes of men, some beneficently and some malignantly. So long as a star shone with a perfectly regular light and smiled on them without any variation, it was hard to believe that it had any sinister intent, but if a star was variable, sometimes bright and sometimes faint, there might possibly be some considerable ground for superstition. There was one star which was even worse than this. He alluded to Algol, which not only did not shine with a regular light, but

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which did that which was generally regarded in polite society as very unbecoming—namely, winked at them. It was winking now, and it had winked hundreds of years ago at the old astrologers and astronomers. They did not like it, and they called the star Algol, or the demon star. For two and a half days a more respectable or well-conducted star did not inhabit the heavens than Algol. It was for that time a star of the second magnitude. At the end of that period it began to close up, and got less and less for three hours. For twenty minutes it was very small. In three hours more it grew until it reached its full size, and then for another two and a half days it smiled away as if it were incapable of doing anything of the kind.

Sir Robert proceeded to explain how the "winking" came about, the discovery having been made quite recently by the aid of the spectroscope. The spectroscope enabled them to solve the question whether a star was coming towards them or receding from them, and it also enabled them to find out the rate at which it was moving. A distinguished German turned his spectroscope on Algol, and found that at one time it was running away at the rate of twenty-six miles a second, but that a few days afterwards it was coming towards him at about the same speed. Sir Robert detailed the other steps in the discovery by which it was ascertained that the "winking" was due to Algol's moving in a circle round another star, which could not be seen because it gave no light, but which periodically obscured the light of Algol as Algol passed behind it.

The lecturer had next thrown upon the screen photographs of an electric spark, the result of an exposure of a ten millioneth part of a second; and a photograph of the Great Nubicula in the southern region, secured after an exposure of seven hours. He spoke at some length upon the last-named, and of the countless myriads of stars which were revealed on the plate. Many of them far surpassed our own sun in magnificence, and only dwindled into the insignificant appearance they here possessed by reason of the awful distance in space. When they dwelt on this and realised that one sun might be attended by a system of worlds as great and important as that which added dignity to our own sun, it began to awaken in them some apprehension of the sublimity of this universe in which our lot was cast.

The last slide was introduced to give an example of the remarkable fecundity of the heavens in stars. There were, he remarked, at least 16,000 stars on the one photographic plate, and it would take 10,000 plates as big as that to cover the sky. That gave them one hundred and sixty millions of stars, which conveyed some impression of the extent of the sidereal heavens when he called in the camera to aid us.

In conclusion the lecturer said that he had told them how the photographic plate saw kinds of light which did not appear to any sense we had, and this began to open up before us some of the most magnificent thoughts which modern science had awakened. Everyone admitted the exquisite beauty of light, but it was only recently that we were

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gradually coming to something like an adequate apprehension of what light really was. We saw the seven colours of the rainbow—red, orange, yellow, green, blue, indigo and violet—and we saw the various combinations of these which gave to Nature its beauty. But beyond these there were multitudes of hues in every sunbeam which no eye could see. Turner or Michael Angelo, or whoever possessed the most exquisite sense of colour, would have no nerve to see these marvellous other colours; and we were gradually learning that what we did see was not a thousandth part of what really existed The colours we saw were little waves about the thirty-thousandth part of an inch long. But waves might be of any length. They might be much less than that, as was the light which the photograph saw. They might be, not a fraction of an inch long, but a whole inch, a yard, a mile, a hundred miles, a thousand miles. It was gradually dawning on us that every beam of the sun did contain waves thousands of miles long, and it was only the waves measured by the thousandth part of an inch that we saw. When we realised that all these beams were poured forth with the utmost profusion through space, that this earth of ours only intercepted a two-thousand-millionth part of all the radiations the sun shed forth, and that even of that radiation the earth did receive we were only able to see the very smallest portion, we began to get some notion as to what light was. And when we reflected that our sun was only one of the countless suns through space, that they were each and all of them filling space in every direction with floods of light, when we reflected on the infinite variety and complexity of this light—then indeed did we realise the majesty of those words which the Creator in the beginning uttered when He said "Let there be light."

November 30th.—Mr. J. D. Paul, F.G.S., on "The Ruins in Bradgate Park, their History and Associations."

The Lecturer said that the mention of Bradgate Park called up pleasant recollections with them all. It was one of the many advantages of Leicester that its residents could reach by a moderate walk a spot where the hand of man had done so much less than usual to mar the beauty of nature. All of them would recollect the view which lay before the spectator where the Ansty footpaths reached the brow of the hill. They looked down on the park at their feet, whilst the brook, with the splendid oak-trees, the bracken with its colour beautiful at all times of the year, the picturesque ruins, backed up by the magnificent mass of chestnuts, with the woods and hills beyond, make up a charming picture. But it was very easy, whilst they gave themselves up to the enjoyment of the scene, to fail to recognize how much its interest and its beauty were increased by the presence of the ruins of the old mansion. Five hundred years ago there was no building where the ruins now stood, and the park was then only an enclosed place devoted to the preservation of game. The ancestors of the family which afterwards built Bradgate House were then living in the old Manor House at Groby.

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The lecturer then went on to speak of the families of Ferrers and Grey, in whose hands the Groby estate remained. He gave an interesting history of the part taken by the descendants of Baron Grey in the Wars of the Roses, and incidentally referred to the romantic marriage of the young King Edward IV. to the widow of Sir John Grey, after an interview with her in Whittlebury Forest, near Grafton. After the battles of Barnet and Tewkesbury, Edward reigned in peace, and the estates of his opponents, who had fallen in the field, were forfeited and distributed amongst his friends. Earl Warwick, among his many country houses, had one at Sutton Coldfield, and Leland, the antiquary, writing 70 years afterwards, said, "After that the earldom of Warwick was attainted and came to the king, the town of Sutton Coldfield, standing in a barren soil, fell daily into decay, and the market was clean forsaken. Wingston, who had taken possession of it on behalf of the king, by authority of his office sold the timber of the manor-place and had part of it himself. The hall itself was set up at Bradgate, the Marquis of Dorset's house at Leicester, and there yet standeth." Thus they might reasonably infer that when his father was firmly seated on the throne, the young marquis, about 1480, commenced the building of Bradgate House, not as a grand residence suitable for a nobleman who stood so near the throne, but more as a hunting seat. When they examined the plan of the house they found it much what they might expect from Leland's account of the way in which part of it was acquired. Its main feature was a large hall, wainscoted on the sides, lighted by windows all round, and probably with an open timbered roof. At the back this hall had an entrance through a porch into an enclosed garden. At the end of it were two wings; the west wing contained the kitchen, with a large open hearth and a bakery adjoining with so many ovens of different capacities, that it would appear likely that a large part of the food consumed in the house was baked. The chambers of the domestics were probably in the two storeys over the kitchen and bakery. At the eastern end of the hall was the unimportant front door, opening into an entrance floored—at least so he inferred from a fragment he himself dug up—with red tiles about eight inches square, ornamented with a simple incised yellow pattern. Beyond this, to the east, was the chapel, opening out from a dining-room, and in this wing were the family apartments. Both wings were roofed in two spans, which presented very effective upright gables to the front. At the outside corner of each wing was an octagon tower. The pit from which the clay was dug for making the bricks might still be seen in a field called The Dumples, near to the farm building on the far side of the reservoir. The only drawing of the exterior of the building which had come down to us was by L. Knyff, a member of a Haarlem family of painters and etchers. The young marquis was not able himself to finish the house. His step-father died when he was 29 years old, and the young prince, who was to succeed as Edward V., was then living under the care of Earl Rivers, the Queen's brother, at Ludlow Castle. The earl set out with his royal

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ward for London, but the Duke of Gloucester met him on his way, took the prince out of his hands, and sent the earl and his brother to Pontefract, where they were beheaded.

The lecturer proceeded to detail the well-known historical circumstances which followed this event. He then referred to the second Marquis of Dorset, who for a long time was imprisoned in the Tower by Henry VII.

Among the celebrities of that day who were connected with Bradgate he might mention the name of Wolsey, who, early in his career, held the post of tutor in the family. The third earl was remembered only as the father of Lady Jane Grey, who was brought up at Bradgate and had as her first tutor Aylmer, afterwards Bishop of London. Roger Ascham was another visitor at Bradgate, and mentioned it in his book, "The Schoolmaster." He said he found Lady Jane Grey in her chamber reading the Phædo of Plato in Greek with as much delight as some gentlemen would a merry tale of Boccaccio. He asked her why she should lose so much pastime in the park, and she answered, "I wisse all their pleasure in the park is but a shadow to that pleasure that I find in Plato; alas! good folk, they never felt what true pleasure means." Mr. Paul read further extracts, and then briefly referred to the tragedy of Lady Jane Grey's life. She and her husband were tried at the Guildhall by a special commission on which sat the Lord Mayor, Sir Thomas White, whose charity was well-known in Leicester. Whilst the unhappy pair were lying under sentence of death, her father and uncle made use of the liberty which had been granted to them to join in Wyatt's insurrection. They attempted unsuccessfully to raise troops in Leicester, and the rebellion was put down after some sharp fighting. The family were left with only one representative, Lord John Grey, who owed his life to the intercession of his wife's friends. He went to live down in Essex, and probably for some years Bradgate was unoccupied. His son Henry was created by James I. Baron Grey of Groby. He sold his Essex property, and returned to live at Bradgate, where he was buried in the chapel. His grandson, another Henry, married Ann, the daughter of William Cecil, Lord Burleigh, and Charles I. bestowed upon him the title of Earl of Stamford. On the outbreak of the dispute between king and Parliament he sided with the latter, and his son Thomas was the Lord Grey so often referred to as an energetic supporter of the Parliamentary party. Later on he became a member of the extreme section. He sat seven days in the High Court on the trial of the king, and signed his death warrant. As one of the leaders of the Anabaptists, or Fifth Monarchy men, whose object it was to overthrow the Protector and set up the kingdom of Christ on earth, he was continually concerned in plots against Cromwell. Twice he was committed to Windsor Castle, but was soon released on giving security for good behaviour.

The history of the subsequent occupants of Bradgate House presented no incidents of any great interest or importance. The house and estate still continued in the possession of the Grey family, who admirably

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discharged the duties of their position. One of them entertained William III. Another married a lady from Kent, who took a dislike to Leicestershire. She wrote to her sister, who evidently like herself was not one of the most prudent persons in the world, complaining that "the country was a desert, and the people in it were beasts," and asking her advice as to what she should do. Her sister recommended her to burn the house down. This she attempted, and very nearly succeeded in burning her husband in his bed in one of the western towers. Though the house this time escaped destruction, it was burnt down some years after and never rebuilt. He had not succeeded in finding any account or even the date of the fire, but it occurred probably about the middle of the last century.

December 16th.—Mr. JESSE HERBERT, (formerly Legal Adviser to the Chinese Government at Canton) on "Life in the Far East."

Mr. HERBERT said he should endeavour to depict to them the life of the people of China as he had seen it during his residence there, rather than the life they read of in books usually written by people who had spent one Sunday at Canton, and came home and described life in China. He had lived at Canton as legal adviser to the South Chinese Government, and he was the first Englishman appointed to a Chinese post. He therefore had had particular and peculiar opportunities of making himself acquainted with the Chinese habits, and had peculiar rights of entrée to the houses of the Chinese themselves.

Mr. Herbert proceeded to describe the peculiarities of the climate which he experienced at Canton, and gave a very vivid account of a typhoon visitation. He then turned to speak of the language, which, he remarked, required the patience of Job and the life of Methusaleh to master. There were 25,000 signs wholly independent one of another. The Chinese had no alphabet, and one had to learn every sign separately. The written language did not accord with the spoken language at all. The English tongue had obtained a mastery in the East, and wherever a foreigner was he must speak "pigeon-English" or business-English. This dialect had been made by the Chinamen learning a few English words and putting some Chinese endings and beginnings to them, and the Englishman let him do it and learnt the words so compounded, and so conversation was carried on.

The lecturer having given some amusing examples of "pigeon-English," turned to speak of the habits and customs of the Chinese. He remarked, amongst other peculiarities, that a son who wished to show his reverence to his father presented him with a coffin. He had seen in the houses of the poor the family dining on the top of a coffin, which was the only piece of furniture in the house, and they were immensely proud of it. One was much struck with the topsy-turveydom of the Far East when compared with the West. There were hardly any European customs of which they could not say that the exact reverse obtained in respect of the Far East.

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Turning to Chinese married life and customs, Mr. Herbert said that young people who were about to be wed did not see each other until they were married. Marriages were frequently arranged by professional match-makers who were paid for their services. There were seven causes which justified divorce, which was a very simple process, and performed without any public-washing of dirty linen to the dislike and distaste of all proper-minded people. A husband could divorce his wife for over-talkativeness. This resulted in a modesty of behaviour and silence, and a condition of graceful submission, which was admirable on the part of wives. A husband who wished to divorce his wife wrote out a notice of divorce, signed it in the presence of an official, handed it to his wife, and from that moment she was divorced. If she preferred it she might be sold, which of course she elected if she did not think herself likely to obtain a home in any other way. It was esteemed a mark of the greatest respect on the part of a widow to kill herself to join her husband in the other world, and a widow was encouraged in every possible way to follow this practice.

After describing with a great deal of humour a visit to the house of an eminent official Chinaman, Mr. Herbert went to say that if civilisation consisted in living kindly amongst their fellows, in living as citizens should live in peace and quietness, and in conducting themselves quietly and orderly in civic life, then the people of Canton at least were civilised. He was struck, not by their happiness, for that seemed wanting on their faces. A stolid patience, as though of long endurance, was marked on their countenances, but still there was no sign of anger, no appearance of riot, no disturbance of the public peace.

A very ludicrous description of the police system of Canton found a place in the lecture. The police were not paid servants, but they made a very good thing out of the office. It was they who kept, for instance, shops for the reception of stolen property, and therefore there was great demand for the situation of constable in Canton. When a robbery took place in Canton it was usual for nothing to be said about it, but if enquiries were made by high officials, and the matter was stirred up, then somebody had to be found to be punished or made a public example of, for that was the intention which the Chinese had before them in punishing offenders. There existed in Canton what was called the "Guild of devoted men," who let themselves out at varying remunerations to "do" a week or a month or more in the native prisons for any particular crime for which someone had to suffer. If a man, therefore, had money, he could in this way always purchase immunity from punishment for any crime he might commit.

Speaking of the Chinese diet, the lecturer said that dogs, cats, and rats were luxuries; and among the other dainties of the Chinese table were a fricassé of sea-slugs, dead silkworms, grubs, and grasshoppers, and seaweed.

In conclusion, Mr. Herbert said he would rather live in an asylum than among the Chinese. He had tried them. Those who were not

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thieving were lying; when they ceased from one they practised the other. They had no sense of morality, no knowledge of sin except it be crime, no sense of sympathy, no conception of love. Fear, cunning and craftiness regulated the Chinaman and his life. He had no sense to which one could appeal, and which was a sense common to the humanity of the western world. But there was something about the Chinaman which after all was admirable. His Government was a democratic Government, based on brains, and brains alone. The Chinese had no class privileged in rank such as the hereditary peerage. They had no body of persons who, by virtue of their birth, had place and profit all the days of their lives. There was no man in China, not even the Viceroys themselves, who could put his son into any place, even under himself, to which profit was attached, until that son had gone into the examination hall, and had been tested and tried there in common with the poorest boy who ventured to submit himself for trial. "Not by birth but by brains shall men rule," was their motto, and he ventured to think that they were not unwise therein. They were admirable for other qualities. The humblest man held himself equal with the highest, so long as he behaved himself. The Chinaman said that good manners marked good education and good breeding, and that nothing made up for a lack of the knowledge of the ceremonies due to one another. Lithe, supple, panther-like as they were, ready to leap on one, and suck one's blood if thereby they could get advantage to themselves, yet when they made a bargain they always adhered to it. The whole structure of Chinese society rested on the often forgotten and too much disregarded commandment, "Honour thy father and thy mother," and after five thousand years Chinese society stood as firmly as it did fifty centuries ago, based upon the honour which children paid to their parents. He thought that China gave an example-lesson to the rest of the world in this—that she was peaceful, non-conquering, humble the younger to the elder, submissive the younger to the elder, adoring the child to his parents.

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AN EDINBURGH REVIEW EDITOR, AND HIS CONTRIBUTORS.

By J. M. Gibson. (Read before Section "A.")

The history of the founding of the Edinburgh Review is very well known. The literary position of Edinburgh at the time was brilliant, and the city possessed young and untried men who were afterwards to add very largely to this reputation. Sydney Smith, Francis Jeffrey, and Henry Brougham, all scholars, lovers of liberty, and advanced radicals of the time, form a trio only second in splendour to the three giants who, some generations earlier, founded the Scriblerus Club, of which we had so excellent an account in a paper read before this section last session.

The idea of the Review originated with Sydney Smith. He was living in Edinburgh as tutor to young Mr. Beach, the son of a Wiltshire squire, in whose parish he had officiated as curate for a few months. The following is his account of its inception: "Towards the end of my residence in Edinburgh, Brougham, Jeffrey, and myself happened to meet in an eighth or ninth storey or flat in Buccleuch Place, the then elevated residence of Mr. Jeffrey. I proposed that we should set up a Review; this was acceded to with acclamation. I was appointed editor, and remained long enough in Edinburgh to edit the first number. The motto I proposed was, *Tenui musam meditamur avena*—'We cultivate literature on a little oatmeal.' This was too near the truth to be admitted, and so we took our grave motto from Publius Syrus, of whom none of us had ever read a line. When I left Edinburgh the Review fell into the stronger hands of Jeffrey and Brougham, and reached the highest point of popularity and success."

This account must be taken somewhat in a Sydney Smithian sense. There were no nine storey houses in Buccleuch Place, and Brougham says the account is largely imaginary. But the fact remains that these three young men did project the Edinburgh Review at a meeting in Jeffrey's house, and the first number appeared in October, 1802, bearing for its motto, *Judex damnatur cum nocens absolvitur*—"The judge is condemned when the guilty are absolved." Jeffrey was very timid, and predicted for it the fate of the original Edinburgh Review, which was born in 1755 and died in 1756, having lived through only two numbers. Never was a worse prediction; the Review was a great success from the first, and still lives, in its 90th year.

When Sydney Smith left Edinburgh, in 1803, Jeffrey was appointed editor, and held the position until 1829. During his tenure of office the

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Review reached its maximum of success. There was need for such an organ. "At the time of its appearance," says Brougham, "Protection reigned triumphant. Parliamentary representation in Scotland had scarcely an existence—the Catholics were unemancipated, the Test Acts unrepealed, men were hanged for stealing a few shillings in a dwelling house, no counsel allowed to a prisoner accused of a capital offence, the horrors of the slave trade tolerated, the prevailing tendencies of the age jobbery and corruption." To bring about some amelioration of this state of things the Review set itself with great earnestness. The work of the promoters was not light; to the first four numbers Sydney Smith contributed 18 articles, Jeffrey 16, and Brougham 21 ; to the first twenty numbers Sydney Smith contributed 23 articles, Jeffrey 75, Brougham 80, and Francis Horner 14. Sir James Mackintosh, Walter Scott, Macvey Napier, and other men of mark were also contributors.

Up to 1808 the Review had the field all to itself. But in that year certain other literary men, and politicians of the opposite camp, with an honest hatred of its politics, and perhaps with some little envy of its success, decided that this must not be. An article of Brougham's on the French Usurpation in Spain precipitated matters, and the Quarterly Review, under the auspices of Southey, Gifford, Walter Scott —who had withdrawn from the Edinburgh on account of political antagonism—and others, was projected, and the first number published in February, 1809. From that time until now the two Reviews have run side by side as rivals.

In 1829 Jeffrey, having been appointed Dean of the Faculty of Advocates, resigned the editorship, deeming the direction of a partisan journal to be scarcely compatible with his new duties, and, upon his recommendation, Mr. Macvey Napier was appointed as his successor. It is with the correspondence of this second editor that I propose to occupy your attention for a short time this evening.

At this time, of the founders of the Review, there only remained in active service two—Jeffrey and Brougham. Horner had died in 1817, and Sydney Smith, though still living, had ceased to contribute, his last article (on the Catholic claims) appearing in 1827. But new writers had joined and, two or three years before his resignation, Jeffrey had enlisted Macaulay as a recruit, and Macaulay remained for many years one of the most prolific, and perhaps the most successful, of all the contributors.

For a time Napier had a difficult task. Some of the old contributors were jealous of any interference with their articles by a new editor, and wished him to understand that certain domains were theirs by right, over which no poaching was to be allowed. On the 28th of December, 1829, J. R. McCulloch writes as follows: "My only object in writing is to express the regret and vexation which I feel that you are to have an article by Spring Rice on the Italian Economists. You may think that I am absurdly sensitive on this point, but such is not the case. My having been allowed to contribute for a dozen years, without any exception but one, the articles on Political Economy, has been in many

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respects of vast consequence to me and, I believe, has done no injury to the Review, which, I may say, has at this moment confessedly the lead in that department. I suppose it is Pecchio's book that Rice means to review. Now the only thing that can interest any one in this book is the attempt to controvert some statements of mine with respect to the priority of the English. Surely, Rice might have found something else to write upon than poking himself into a controversy between Pecchio and myself."

Napier replied very firmly: "You think that I ought to have rejected an article on the Italian Economists by Spring Rice on the ground that the whole province of Political Economy ought to be kept sacred for yourself. It is impossible for me to agree to this. No one connected with the Review, none even of its founders, has ever claimed an exclusive domain over any particular province. Had any one made such a proposal I should have declined being editor on such a footing." McCulloch is not appeased; he retorts that there was a general understanding that he was to do the Political Economy articles, that Rice, although a respectable man, has not the slightest knowledge of the science, and that he dislikes him simply because he comes within his beat. But he swallows the pill nevertheless, and remains a contributor.

It was with Brougham that Napier had the most difficulty. As an original founder of the Review, and one of the most powerful and constant writers to it, it was of the greatest importance to keep him as a contributor. Napier was, therefore, much troubled at his holding aloof from the first one or two numbers, the only reason given—and that to Jeffrey, not Napier—being that he doubted whether he could suddenly transfer himself from Jeffrey even to his own brother. Jeffrey assured Napier that he need not fear but that Brougham would soon come back, and he was right. In July of the following year (1830) he had three articles, and from this time forward his correspondence with the editor is voluminous and exasperating.

Macaulay writes in August, 1830, that he is going to France for a few weeks, where he will be in the best political society, and he proposes to write an article on the politics of France since the Restoration. Brougham, hearing of this, writes to Napier as follows: "I must beg, and indeed make a point of giving you my thoughts on the Revolution, and therefore pray send off your countermand to Macaulay. The reason is this—all our movements next session turn on that pivot, and I can trust no one but myself with it, either in or out of Parliament. Jeffrey always used to arrange it so upon delicate questions, and the reason is obvious. Were it possible, which it plainly is not, to disconnect me and the party from the Edinburgh Review, I should care little how such questions might be treated there; but, as it is, I and the party I lead are really committed. I have already begun my article, and it is of great importance that it should stand at the head."

When Napier wrote to Macaulay telling him that Brougham was writing the article on the French Revolution, Macaulay replied as

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follows: "I cannot deny that I am much vexed at what has happened. It is not very agreeable to me to find that I have thrown away the labour of a month, particularly as I have not many months of perfect leisure. This would not have happened if Brougham had notified his intention to you earlier, as he ought in courtesy to have done. He must have known that this French question was one on which many people would be desirous to write." He then goes on to say that he had received an application in Paris to write an article on the Revolution for a publication there, but had declined as he felt himself in honour bound to Napier, and had recommended another person for the task. Continuing, he says, "To that person my correspondent has probably applied. At all events I cannot revive the negociation. I cannot hawk my rejected articles up and down Paternoster Row. I am therefore a good deal vexed at this affair, but I am not in the least surprised at it. I see all the difficulties of your situation. Indeed, I have long foreseen them. I always knew that in every association, literary or political, Brougham would wish to domineer. I knew also that no editor of the Edinburgh Review could, without risking the ruin of the publication, resolutely oppose the demands of a man so able and powerful. It was because I was certain that he would exact submissions, which I am not disposed to make, that I wished last year to give up writing for the Review. My expectations have been exactly realised. The present constitution of the Edinburgh Review is this, that at whatever time Brougham may be pleased to notify his intention of writing on any subject, all previous engagements are to be considered as annulled by that notification. His language, translated into plain English, is this, 'I must write about this French Revolution and I will write about it. If you have told Macaulay to do it, you may tell him to let it alone. If he has written an article he may throw it behind the grate. He would not himself have the assurance to compare his own claims with mine. I am a man who acts a prominent part in the world, he is nobody. If he must be reviewing, there is my speech about the West Indies. Set him to write a puff on that. What have people like him to do, except to eulogise people like me?' No man like to be reminded of his inferiority in such a way. I know that Brougham dislikes me, and I have not the slightest doubt that he feels great pleasure at having taken the subject out of my hands, and at having made me understand—as I do most clearly understand—how far my services are rated below his. I do not blame you in the least. I do not see how you could have acted otherwise. But, on the other hand, I do not see why I should make any efforts or sacrifices for a Review which lies under an intolerable dictation. Whatever my writings may be worth, it is not for want of strong solicitations and tempting offers from other quarters that I have continued to send them to the Review. I adhered to the connection solely because I took pride and pleasure in it. It has now become a source of humiliation and mortification.

If you had used me ill I might complain and might hope to be better treated another time. Unhappily, you are in a situation in which

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it is proper for you to do what it would be improper for me to endure. I hope you will forgive me if I say that I feel what has now passed too strongly to be inclined to expose myself to a recurrence of the same vexations."

What Napier wrote in reply to this we do not know, but Macaulay was magnanimous and wrote a long letter back, in which he said: "I am extremely sorry to find that my letter gave you pain. I must have expressed myself very ill if I led you to think that I felt any personal resentment against you, or that I considered my secession from the Review as a punishment. If the whole question had been between you and me, the expressions of kindness and regret which you employed would have more than satisfied me. But there was another person concerned—the person of all persons upon earth to whose dictation I feel least inclined to stoop. Your intentions towards me I know are perfectly kind and fair; I have no such confidence with respect to his."

After again repeating that he knows how much more important Brougham is to the Review than he himself, and the great injury that his secession would do, Macaulay concludes by promising an article for the next number. Henceforth Macaulay's relations with Napier are always most friendly and generous—not so Brougham's.

Writing in September, 1830, Brougham thus refers to the death of Mr. Huskisson at the opening of the Manchester and Liverpool Railway: "I have come to Liverpool only to see a tragedy. Poor Huskisson is either dead or must die to-morrow. He has been killed by a steam carriage. The folly of 700 people going 15 miles an hour in six carriages, on a narrow road, exceeds belief."

To the number for April, 1835, Brougham contributed six articles, and shortly afterwards, for some reason not very clear, writes as follows: "Ever since you succeeded to the management of the Edinburgh Review, I have found that my assistance was reckoned, justly God knows, a very secondary object, and that one of the earliest friends of the journal, and who had (Jeffrey will inform you) enabled it to struggle through its first difficulties as much as any one or even two of the contributors, was now next thing to laid upon the shelf. This is the common lot of those who, in any concern, outlive their contemporaries, and no one, I must say it for myself, has less of personal punctilio about him, or cares less for such trifles when in pursuit of a great object. But, at the same time, I really do feel that I ought not to be merely made a hack of, and 'offered' such and such books; that is, whatever nobody else likes to do. Yet it does so happen that of late years this is my position. Dr. Southey, I assure you, is considered in a very different way by the Edinburgh Review. However, let that pass. My resolution now is that I shall review such things as suit my taste and my views on subjects and on public affairs, and if there is any kind of objection in any quarter I cannot help it."

Napier's reply to this letter drew a second letter from Brougham couched in a much more friendly tone. Within three months Napier

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wrote to him again as to two articles he had written for the forthcoming number, declining to print them as written, on the ground of their somewhat offensive personal allusions to various members of the Whig ministry of the day. "The Edinburgh Review," he says, "I need not tell you, has ever been attached to the Whig party. It is but the other day that it indignantly repudiated the doctrine of 'measures not men'"—and he firmly refuses to allow the Review to be brought into anything like antagonism to the Whigs.

Brougham replied, denying that the Edinburgh is avowedly a party review, and said that it had attacked the Whigs repeatedly. "What think you of 'the merciless aristocracy of the Whigs?' 'As aristocratic as a city peer or a Whig patriot?' In 1813 and 1814, Sydney Smith directly attacked Lords Grey and Grenville. I say this by way of protesting against a principle which would sink the Edinburgh Review below almost any one of the daily papers, namely, that nothing is to be inserted which may displease any Whig minister or leader. As to the ersonal allusions, they are what I should say again in my place. I know I have said far worse."

For a year or two things went more smoothly, but in 1837 Brougham again wrote, as a most imperative duty, to draw Napier's attention to the fate which, in Brougham's opinion, is hastening upon the Review. He complains that it is becoming a mere Treasury journal, and is afraid to review the Duke of Wellington's despatches because it would be obliged to praise them, and it will not praise a political adversary.

Napier denies that he is in any way lowering the character of the Review, though he will not allow it to be looked upon as other than an organ of the Whigs. He protests that Brougham is quite wrong about the Duke's despatches, and fears that in proportion as Brougham's views on various matters differ from his own, his position as editor will become more and more embarrassing. Brougham returns to the attack because Napier refuses to insert a political article of his. Napier appeals to Jeffrey, who writes him a very cautious letter, fully appreciating the difficulties of his position, agreeing with him as to the general policy of the review, but hoping that he will so manage as not to lose the services of Brougham. John Allen writes from that home of Whiggery, Holland House: "I can easily conceive how you will have perpetually recurring difficulties with Lord Brougham, but the Review is too useful an instrument to be thrown away. He may coax or bluster, but he will not break with you. In your situation I would reject all personalities and extravagant opinions, but refuse nothing in itself reasonable or plausible because it went beyond the doctrines hitherto maintained in the Review. Great allowance must be made for his situation. After all the service he has rendered to public liberty, it is a cruel state to be in a manner proscribed by all his former associates, and it is no alleviation to his mind that he has incurred the misfortune by his own faults. He has often fallen before, but has always risen again with renewed vigour, and I have no doubt he will again make himself a formidable person, but I fear he

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will be more used than trusted. We have had no quarrel, but I never see him nor hear from him."

After two or three more letters on either side matters calm down; Napier proposes the publication of Brougham's speeches, a suggestion to which the latter lends a willing ear, and in this new diversion their quarrel is extinguished.

Two or three times within the next few years the same kind of thing occurs—Brougham complaining of the conduct of the Review, and Napier declining to alter it, and threatening to give up the editorship, but I will not weary you by continuing the subject. Brougham undoubtedly was an exceedingly awkward man to deal with—domineering by nature, jealous of anyone writing on a subject that he thought he could do himself, and with a profound belief in his own omniscience. Had Napier not been firm with him, there would have been considerable danger of Brougham's giving such a personal bias to the Review as would undoubtedly have been detrimental to its interests. On the other hand, Napier appears to have been unduly afraid of wounding the susceptibilities of the Whigs, and rigorously excluded anything that could offend them. He was a straight party man.

Before leaving Brougham for other contributors, let me here quote a few lines from a letter to Napier, written by Jeffery, in 1839. It was in reference to the report that had got abroad that Brougham had met with his death by a carriage accident—a rumour which, it was widely believed, Brougham had set going himself, in order to see what would be said of him by the newspapers. Jeffrey writes: "I never for an instant believed the strange story of Brougham's death, feeling that it was quite impossible that six posts should have come from Carlisle to Edinburgh without any tidings of such an event, and that it should have first come to us from London. I rejoice with you at the generosity with which his political opponents have generally suggested his epitaph, though I am perhaps less surprised at it. The English public is naturally generous and humane, and there was much in such a fate to soften all asperities. But, who would not mourn for Brougham? and who does not rejoice that the time is not yet come when the land is to be darkened by the extinction of so great a light? I wish to heaven its course were better ordered. A glorious planet he might have been, but disdaining to be less than a sun, he has run the wild career of a comet, threatening all systems with disturbance—and what will the end be?"

In December, 1833, the Directors of the East India Company elected Macaulay one of the members of the Supreme Council, a position which required his residence in India for a few years. In announcing the fact to Napier, he writes as follows: "It would be mere affectation in me to pretend not to know that my support is of some importance to the Edinburgh Review. In the situation in which I shall now be placed, a connection with the Review will be of considerable importance to me. I know well how dangerous it is for a public man wholly to withdraw himself from the public eye. During an absence of six years I run

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some risk of losing most of the distinction, literary and political, which I have acquired. As a means of keeping myself in the recollection of my countrymen during my sojourn abroad the Review will be invaluable to me." He then proposes that, as he would like to be supplied with the best books as they appear in England, Napier should send him a supply as they come out, in payment for the articles which he proposes still to contribute to the Review. Napier recognised the generosity of this proposal, but, whilst sending the books, insisted on sending also what he considered a suitable money payment.

The first article Macaulay sent from India was a review of Mackintosh's "History of the Revolution"; his second was the famous article on Lord Bacon. It was of great length, and Napier submitted it to Jeffrey before publishing it, asking his advice as to the propriety of cutting it down. Jeffrey replied: "What mortal could ever dream of cutting out the least particle of this precious work to make it fit better into your Review? It would be worse than paring down the Pitt diamond to fit the old setting of a dowager's ring. It is altogether magnificent. Since Bacon himself, I do not know that there has been anything so fine. I have read it not only with delight, but with emotion—with throbbing of the heart and tears in the eye. The first five or six pages are in a lower tone, but still magnificent, and not to be defrauded of a word. Still I do not object to consider whether it might not be best to serve up the rich repast in two courses, and, on the whole, I incline to that partition. One hundred and twenty pages might cloy even epicures."

Bulwer Lytton, speaking of the same essay, says: "Macaulay's paper is striking and brilliant, as is all that comes from his vigorous mind and prodigal fancy." After pointing out some things in it with which he disagrees, he says: "Enough of these criticisms on criticism. I may differ with Macaulay, but his genius in this article, as in all else, is of a prodigious and gigantic character. He is formed to be the man of his age."

Brougham, as might be expected, was much less complimentary. He admits that it is very striking and clever, but complains of the style, of the superabundance of words, and says that Macaulay is quite ignorant of the subject of Inductive Philosophy, has no science at all, and cannot reason.

Macaulay returned to London from India in 1838. Napier proposed to him Lockhart's "Life of Scott" as a subject for review, but he declined it. "I am not successful in analyzing the effect of works of genius. I have never written a page of criticism on poetry or the fine arts which I would not burn if I had the power. Hazlitt used to say of himself, 'I am nothing if not critical'—the case with me is exactly the reverse. There are other objections. Surely it would be desirable that some person who knew Sir Walter should be charged with this article. I knew no more of him than I know of Dryden or Addison—not a tenth part as much as I know of Swift, Cowper, or Johnson. Why

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cannot you prevail on Lord Jeffrey to furnish you with this article? No man could do it half so well. He knew and loved Scott, and would perform the critical part of the work incomparably."

In February, 1839, Macaulay having just returned from Italy, writes: "I have bought Gladstone's book on Church and State, and I think I can make a good article on it. It seems to me the very thing for a spirited, popular, and gentlemanlike critique." And, a fortnight later: "I can promise you the article in a week or ten days at latest. Of its length I cannot speak with certainty. I should think it would fill about forty pages, but I find the subject grows on me. I think that I shall dispose completely of Gladstone's theory. I wish that I could see my way clearly to a good counter theory, but I catch only glimpses here and there of what I take to be truth. By-the bye, I met Gladstone at Rome. We talked and walked together in St. Peter's during the best part of an afternoon, and I have, in consequence, been more civil to him personally than I should otherwise have been. He is both a clever and an amiable man, with all his fanaticism. As to politics, the cloud has blown over; the barometer is rising. Everything and everybody is languid, and even Brougham seems to be somewhat mitigated. I met him in Lincoln's Inn Fields the other day, when I was walking with Ellis. He greeted me as if we had breakfasted together that morning, and went on to declaim against everybody with even more than his usual parts, and with all his usual rashness and flightiness."

Macaulay's article on Clive appeared in the number for January, 1840. It provoked Brougham to wrath and righteous self-laudation. "I am amazed at Macaulay praising Clive so immeasurably. He was a great, but a very bad man. All men know that he was a robber, publicly, and a cruel, bloodthirsty man, and all Indians know that he actually robbed Orme, the historian, a nervous man, whom he throttled on the walk near the Ganges, and extorted £10 000." † And again, he writes: "I have no heart to say one word on any subject in the last number but one — I mean one which absorbs all others — Macaulay's most profligate political morality. In my eyes, his defence of Clive, and the audacious grounds of it, merit execration. It is a most serious and, to me, a painful subject. No, no; all the sentences a man can turn, even if he made them in pure taste, and not in Tom's snip snap taste of the lower empire, all won't avail against a rotten morality. After I had, and chiefly in the Edinburgh Review, been trying to restore a better, a purer, a higher standard of morals, and to wean men from a silly love of military glory, I find the Edinburgh Review preaching, not merely the old and common heresies, but ten thousand times worse, adopting a vile principle, never yet avowed in terms. A peculator, a cheat, a forger, a cutthroat—admitted—oh, but then a clever one, and a bold and a successful. If Macaulay only knew the comfort of laying down his head to sleep, or may be to die,

† This story rests on no good authority.

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after writing 40 years and speaking 35, and never having once said one word, or written one word, but in favour of the highest strain of public virtue!"

Of the same article Sir James Stephen says: "Everybody seems delighted with the story of Lord Clive. I hope that you are in possession of some more historical Asiatic portraits from the same hand."

In the following year Macaulay wrote the companion article on Warren Hastings, which was received by Brougham much more cordially.

He continued to write for the Review until 1844, when he became very much engrossed with his history, and, much to Napier's regret, was obliged to cease contributing.

Other well-known writers who wrote more or less copiously for the Review were Carlyle, Lord Lytton, Sir James Stephen, Nassau Senior, and John Stuart Mill.

Carlyle reviewed Taylor's "Historical Survey of German Poetry" in 1830, and then asked for an English subject to be offered to him next. He half proposed to write an article on Jeremy Bentham—"a faithful, loving, and yet critical, and in part condemnatory, delineation. Bentham is a denier; he denies with a loud and universally convincing voice; his fault is that he can affirm nothing, except that money is pleasant in the purse and food in the stomach, and that by this simplest of all beliefs he can reorganize society."

This article never appeared, nor another which he also proposed to himself on Fashionable Novels, "to extinguish the Pelham and Devereux manufacture." He wrote an article on Ebenezer Elliott's "Corn Law Rhymes," and another review of German works.

Sir James Stephen was a more constant contributor. His first contribution was an article on Wilberforce, which appeared in 1838. In acknowledging the receipt of a letter from Napier containing payment for this article, he says in writing the paper he only thought of the gratification of giving utterance to the deep affection he felt for Wilberforce. He does not object to being paid for it, but considers he is paid too handsomely. "May I inquire," he says, "whether the remuneration given is a deduction from the rewards of the Editor, or from the profits of the bookseller. For the latter, I have no bowels, but for a man whose profession is either wholly or partly literature, it is impossible not to entertain a different regard. In plain terms, if this money comes out of your pocket, I must request you to permit me to receive it in payment for two articles, and not for one. If your bookseller pays it, than I am but one of a shoal of fishes who feed upon a great whale, whose instinct will sufficiently protect his own oil"

Stephen's contributions comprised the essays which have since been collected in two volumes under the title of "Essays in Ecclesiastical Biography." St. Francis of Assisi, Richard Baxter, Ignatius Loyola, The Port Royalists—such were the subjects which he made his special province. One of his latest articles was on the Clapham Sect—Patent

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Christians, as Sydney Smith called them. Amongst them were Wilberforce, Zachary Macaulay, and Hannah More, and Stephen, who knew them and liked them well, wrote an appreciative essay.

Nassau William Senior was a writer on very different subjects. Stephen said of him that his special walk was that of comprehensive, mature, and luminous thinking about permanent national interests, and that, upon those subjects, he could not be rated too highly. But, he continues, "Senior, excellent as he is, resembles, as Johnson says of Milton, the teacher from whom we turn away in search of a playfellow." Senior's articles were upon social and political questions. The Law of Nations, Mendicancy in Ireland, Lewis on the Government of Dependencies, The Irish Poor Law, are some of them. Discursive, gossipping literature was his aversion. Writing about a review of the "Recreations of Christopher North," he says: "The article on Christopher North is my abomination. I think him one of the very worst of the clever bad writers who infest modern literature; full of bombast, affectation, conceit. I had almost as soon try to read Carlyle or Coleridge."

In April, 1840, John Stuart Mill terminated his connection with the Westminster Review, owing to a change of ownership, and wrote to Napier volunteering to write for the Edinburgh. Napier gladly accepted him, having had communications from his father, James Mill, when he, Napier, was editing the *Encyclopedia Britannica* 15 or 20 years before. Mill's first article was on Democracy in America, and he proposes to follow this up with articles on French and Roman History. Then for two years he was silent until, in 1843, an article by Empson on Jeremy Bentham contained some remarks derogatory to his father, and Mill wrote to Napier to protest. Shortly afterwards he reviewed Helps's little book, "The Claims of Labour," which Jeffrey said was excellently done.

But Mill, like Macaulay, soon became too much absorbed in more substantial work to continue reviewing; his book on Logic was occupying his attention. He, however, found time to review Grote's "History of Greece" in 1846.

A few words about two other contributors and I have finished. In 1839, Macaulay wrote to Napier to say that Charles Buller had expressed a wish to be admitted among the contributors to the Edinburgh Review. "I think him an exceedingly clever fellow," says Macaulay, "with much more depth than appears at first sight. His faults are flippancy and levity, and a disposition to make a jest of everything. This turn of mind, under some restraint, is, as you well know, by no means illsuited to the business of reviewing. The sort of subject which would suit him best would be a volume of travels in the United States, an absurd biography, like Sir William Knighton's, the crazy publications of the teetotallers, and so forth."

Accordingly Buller was enlisted. Napier asked him to write an article on Lord Alvanley on the State of Ireland, and Payment of the Catholic Clergy, which he agreed to do. In acknowledging Napier's

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letter he says: "You need not have specified 'moderation' and 'hesitation,' for, if there are any two qualities in the world that I excel in, these are the very two. Between ourselves, my model in the expression of my opinions is my friend, Lord Ashburton, and I trust I shall soon attain his perfection of hesitation. My opinion of Macaulay's article on Warren Hastings is much more unfavourable than I expressed it to you. Indeed, I shall never get another dinner from Lady Holland for openly and bluntly expressing it at her table."

History repeats itself. With an alteration in the proper names, the following letter of Buller's might have been written specially for the present times: "I foresaw the probability of such criticisms as you describe to me on my article, and should not have been surprised had you desired more alterations in order to preserve the consistency of the Review with its doctrines in Lord Grey's time. But I think that you were decidedly right in the view which you took at first, and which induced you to brave such reproaches. At the time of the Coercion Bill you, with 19-20ths of the Liberal party in Parliament, supported it against O'Connell. For the last five or six years you, with 19-20ths of the same Liberal party, have been supporting a precisely different policy. Your present course is, therefore, a direct contradiction of your former one. In that, and not in the phraseology of our article, is the inconsistency. Every act our friends do now is a practical acknowledgment of the truth that our hostility to O'Connell, while Stanley was in office, was the great blunder of our party. It is of no use to deny this by words while all our acts acknowledge it; and if we always have an eye to the past, while we are speaking of the present, we only put our present course on a less strong ground than we should. In all parties, and consequently in their organs, it becomes occasionally necessary to throw over past blunders, and when one does so, the best course is to speak decidedly in favour of our present convictions, without weakening an argument by a wish to palliate a line of conduct which we have abandoned."

It happened that in 1845 the two great novelists, Dickens and Thackeray, were both in communication with Napier as to contributing to the Review. Dickens proposed to write an article on the Punishment of Death, and its effect upon society. He believed it to have a horrible fascination for many of those persons who render themselves liable to it, impelling them onward to the acquisition of a frightful notoriety. Though agreed to by Napier, the article did not appear, and I am not aware that Dickens wrote anything in the Review.

Thackeray reviewed N. P. Willis's "Dashes at Life" in the number for October, 1845. Jeffrey's opinion was that the book had better have been left alone as not being worth reviewing, and thought the reviewer, I regret to say, was not much better than the author. In acknowledging the receipt of the payment for this article, Thackeray wrote: "I have just received and acknowledge with many thanks your banker's bill. From them or from you, I shall always be delighted to receive communi-

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cations of this nature. From your liberal payment I can't but conclude that you reward me not only for labouring, but for being mutilated in your service. I assure you I suffered cruelly by the amputation which you were obliged to inflict upon my poor dear paper. I mourn still, as what father can help doing for his children? for several lovely jokes and promising facetiæ, which were born and might have lived but for your scissors, urged by ruthless necessity."

The last number of the Review which Napier edited was that for January, 1847. He had been ailing for a long time, but had manfully stuck to his work, and he died on the 11th of February, 1847, at the age of 70. His work as Editor had been a trying one in some respects, but it was work he delighted in, and the Review suffered no decay whilst it was under his guidance.

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THE MENTAL CAPACITY OF ANIMALS.

By F. T. Mott, F.R.G.S. (Read before Section "D").

Fifty years ago Man, in the popular conception, was in no way related to the animal kingdom. He was the Lord of Creation, for whose benefit all else was made. The other living inhabitants of this world were "the beasts which perish." Modern science has largely altered this conception, though it has not yet extinguished it. The relationship between man and the lower animals is now generally accepted as a fact, and a large amount of thought and investigation is expended in discovering the lines of relationship in various directions.

Among all known animals man's nearest relatives appear to be the anthropoid apes, and yet there are such wide differences between the two groups in the skull, the hands and feet, the clothing of the skin and the general capacities and habits that the relationship cannot be very close. Moreover, man's mastery of complex language, and his power of rapidly accumulating knowledge, are so strikingly unique that when he is regarded in this intellectual aspect the most advanced apes seem a very long way behind.

The Darwinian theory is that man and the apes are distant cousins; that in some pre-glacial age the young of some unknown animal probably allied to the lemurs, developed a tendency to variation in several directions; that two of these variations being particularly well adapted to their environments were preserved, whenever they appeared, by natural selection, and thus growing stronger, generation after generation, attained at last, one of them to the condition of the apes, the other to that of man.

We naturally ask ourselves the question, what was the fundamental difference between these two varieties that one should have so enormously outstripped the other?

The most prominent difference between the two groups as we know them at the present time is the difference of mental power. An ape may exhibit a good many traits of intelligence and feeling, but if it knows 4 from 5, and shows special affection for its master, we think much of it, and wonder at its approach to humanity. What is this, however, to the power of thought which can calculate the position of an invisible planet, or the lofty sentiment with which man meets martyrdom in the cause of Right? How has man attained to this immense superiority? Something may be due to difference of food: to the fact that the human variety has always lived largely upon flesh, while the apes have taken to a vegetable and therefore a less concentrated diet. And although neo-Darwinism will not admit that any advantageous habits thus acquired could be transmitted

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by heredity, yet the energy derived from stimulating food may certainly be communicated to the germ-plasm as well as to other parts of the organism, and cause its capacities to be more rapidly unfolded. But diet alone does not satisfactorily account for humanity. There are races in various portions of the world whose diet has been mainly vegetable for unknown ages, yet they are men not apes.

There is a perfectly definite line of division between the two groups; one is never mistaken for the other. Where does that line of division originate, and what are the characters which define it?

In considering those characters from various standpoints we are always brought back to the difference of mental capacity. This lies at the root of the whole matter. It is this which gives man language, art, and science. Wit, humour, mirthfulness, poetry, arithmetic, mathematics, the arts of building, metal working, clothes-making, &c., are all results of this superior mental capacity, and this capacity seems to consist of an ability in the human mind to entertain *abstract ideas*, as distinguished from sense-impressions and mere concrete ideas.

An ape feels pain if he is bitten by an enemy; recognises the enemy which wounded him, remembers that enemy, always associates the idea of him with the idea of pain, avoids him with fear or flies at him with vengeance, perceives that his young might also be hurt and defends them valiantly. He may see another ape fighting, and may recognise the fact that he is fighting for his young; he may see a third ape come to the assistance of the second and fight bravely by his side; but he will never entertain the abstract ideas of courage, of domestic affection, of kindness or self-sacrifice. It is not only that he will not have these *names* in his mind, he will not even have any such ideas. These abstract ideas arise in the mind of man spontaneously after reflecting upon a group of simple ideas. But they do not, so far as we know, arise in the mind of any animal. A dog might possibly discover that when one man called him for food there was always food to be got, and that when another man called him he was frequently deceived, but he would never attain to the idea of Truth, as an abstraction, an idea by itself. Such ideas as space and time, weight, number, antiquity, usefulness, beauty, right, goodness, or wickedness, and all the host of abstract notions with which man's intellectual life is principally concerned, appear to be beyond the reach of the lower animals.

I think it can be shown that this capacity of abstract thinking is the peculiarly human element which has so widely differentiated man from the beasts. In the first place it is the cause of articulate speech. The language of animals scarcely expresses more than the simplest concrete ideas, as the cry of pain, the snarl of defiance, the coo of pleasure. The earliest men would use a similar language at first—a language of imitative names—but they must very soon have made attempts at expressive abstractions, and then came in the first use of verbs and adjectives. To predicate the character or quality of anything is to think abstractly. To say "This iron is hot," "That horse trots," "The bird flew," is to express

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ideas which only come by reflection. Ideas of heat, trotting, and flying are examples of the simplest abstractions or generalizations, after a number of sense experiences have been compared and reflected upon. No animal would ever say to its neighbour "The bird flew away," because the abstract idea of flight as a quality attaching to birds in general would never enter into its consciousness.

The lowest plane of intelligence is that which takes cognizance of sense-impressions. When a sensory organ, whether of touch, taste, smell, hearing or sight, receives energy from without, this energy is carried to the brain, but there is no consciousness of it until it is trans mitted into a mental idea. These simple and initiatory ideas we call sensations. They are common to both animals and man. When a number of these have been recognised a higher plane of intellect comes into operation—the *reflective* capacity, by which these ideas of sensation are compared and distinguished and classified. This reflective capacity is no doubt possessed by animals to some small extent, but it is in this plane that man's intellect makes its great leap forward and becomes differentiated from that of all lower beings. When man reflects upon his sensations he recognises among certain groups of them certain elements of identity, as among a number of sensations of touch he may recognise a certain yielding to resistance to which he gives the abstract name of "softness," or a non-yielding quality which he abstracts under the name of "hardness." Of course he does not *name* these qualities at first, but he recognises them, and it is just the desire to communicate to other men these abstract ideas which gives birth to language. Conversation is the interchange of abstract thought, and conversation is impossible to animals because their reflective capacity is too imperfect to give rise to definite abstract ideas. It is generally now admitted that the part of the brain concerned in reflection is the upper part of the front of the cerebral hemisphere—that part which occupies the forehead—and in man's external form there is nothing more strikingly different from the form of all animals than the shape and prominence of his forehead.

Man's power of reflective abstraction opens to him such a new field of possibilities as must in any rational classification place him by himself in a distinct order of beings. Its first fruit is language, the medium by which he expresses his own abstract thinking, and comes into joint possession of the thinking of his neighbours. To this intercommunication is due the *accumulation* of knowledge, and this accumulation is the basis of all civilization and mental development. Races of living beings which cannot talk are incapable of civilization. The mental capacity of animals is limited to simple concrete ideas. They cannot converse, they cannot accumulate knowledge, and for them there is no progressive civilization.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Three Meetings have been held during the Session, the average attendance being 12 members.

The following ladies and gentlemen have joined the Section :—Mrs. J. D. Paul, Miss Adderly, Miss Bolus, Mrs. C. Stretton, Rev. J. E. Stocks, Dr. Clements, and Mr. W. H. Turner.

October 20th.—"An *Edinburgh Review* Editor and his Contributors," by the CHAIRMAN.

November 17th.—"An English Village in the 13th Century," by Mr. A. H. BENNETT.

December 8th.—"Two Old Libraries of Leicester," by Mr. F. S. HERNE.

The Chairman's Paper will be found on page 443 of the Transactions.

J. M. GIMSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

September 16th, 1891.—Present, five gentlemen, six ladies. Miss M. H. Ward, of Belgrave House, was elected a member of the Section.

Excursion.—Miss HOTTINGER reported that the Excursion to Swithland and Thurcaston was attended by five members. The route laid out was found to be too long, and Swithland Wood was omitted. The members were very hospitably entertained, by the CHAIRMAN, at Thurcaston Rectory, whose garden, stored with an extraordinary variety of herbaceous plants, is always a paradise for botanists. *Campanula patula* was found still flourishing near Buddon Wood, and *Jasione montana* was gathered on the adjoining Common.

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Exhibits.—Miss HOTTINGER exhibited a number of interesting fresh and dried plants from Norway and Ireland, including *Linnæa borealis*, *Trientalis europæa*, *Cornus suecica*, *Ranunculus glacialis*, *Juniperus nana*, &c.; also *Eucomis punctata*, from South Africa.

Herbarium.—A number of specimens were brought, ready dried, and were distributed to the various receivers to be mounted and classified. Mr. MOTT reported that the cabinet was ready to receive them. It had cost £4 4s., and this, with the paper and labels, would considerably exceed the £6 granted by the Society. The funds of the Section would provide something, but it would be necessary to apply to the Council for a supplementary grant.

Paper.—The CHAIRMAN read a Paper on "The Winter Aconite" (*Eranthis hiemalis*), a well-known but rather remarkable plant belonging to the order *Ranunculaceæ*—not indigenous to Britain, but semi-naturalised. The flowers appear before the leaves; and he had recorded their opening as early as January 21. He was inclined to regard what was usually called the green involucre as the true calyx.

The Paper was illustrated by drawings and specimens.

Home Reading Circle.—The attempt of the Section to carry on a circle for the reading of Natural Science, in connection with the Home Reading Union, had not proved very successful and it was decided to abandon it.

October 21st.—Present, thirteen gentlemen, six ladies. Miss LAUNDON, of St. Stephen's Road, was elected a member of the Section.

The VICE-CHAIRMAN read a letter of apology from the CHAIRMAN for non-attendance, owing to family bereavement. He also announced that the microscopical work put down on the programme for this evening could not be carried out, as their new room was still unfinished.

Exhibits.—Mr. W. A. VICE exhibited a large collection of fresh Fungi, including *Agaricus squarrosus* and *velutipes*; *Hygrophorus pratensis* and *coccineus*; *Coprinus atramentarius*; *Polyporus versicolor* and *hispidus*; *Cordyceps militaris* and *entomorrhyza*; *Hylaria hypoxylon*, &c.

Paper.—Miss HOTTINGER read a Paper entitled "A Ramble in the Abbey Park," describing a large number of the most interesting trees, shrubs, and herbaceous plants to be seen there, pointing out the great value of such a park as a place of instruction for all botanists, and the increased benefit to be obtained if all the important species could be clearly labelled, and suggesting a number of species of trees, shrubs which were not yet to be found in the park, but which might be introduced with advantage. The Paper was illustrated by about 20 fresh specimens of plants, in flower or fruit, just gathered in the park, and about 50 dried specimens, gathered there by Mr. E. F. COOPER, in July.

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Herbarium.—The VICE-CHAIRMAN reported that several hundred specimens were now ready for the Herbarium, and that the new room would probably be ready for use before Christmas.

Mr. TURNER presented a specimen of *Linum angustifolium*, gathered in Victoria Road in July last.

Mr. BURFORD suggested the desirability of recording all the native plants which occurred in *the town* of Leicester, as was being done in London. It was thought, however, that the cases were scarcely parallel, the area covered with streets being scarcely large enough in Leicester to make the record important.

November 18.—Present, eleven gentlemen, four ladies. Miss LEWIS was elected a member of the Section

Exhibits.—The CHAIRMAN exhibited a Halter made of lace-bark (*Lagetta lintearia*) from the West Indies, which appeared to be made merely of twisted bark and to be very strong and flexible; also specimens of the pitcher-shaped leaves of *Nepenthes* and *Sarracenia*. Mr. MOTT mentioned that a magnificent collection of these pitcher-plants might be seen growing in the greenhouses of Mr. FARNHAM, at Quorn House.

Miss HOTTINGER exhibited a plant of *Stachys tuberifera*, with root and edible tubers attached; also specimens of *Colchicum autumnale*, and a curious Michaelmas Daisy from Mexico.

Dr. TOMKINS stated with respect to *Colchicum* that both the corm and the seed would certainly be poisonous to cattle. Several instances were mentioned of cattle dying in the fields apparently from poison, when no sufficiently poisonous plant was known to be present.

Mr. MOTT suggested that in such cases *Conium maculatum* should be looked for in the hedges.

Mr. VICE exhibited specimens of the curious "Bird's-nest" Fungi, *Cyathus vernicosus* and *Crucibulum vulgare*, the latter not previously recorded in the county.

Paper.—Mr. MOTT read a Paper on "The Mental Capacity of Animals," pointing out that their intellectual capacity was not equal to the recognition of abstract ideas; that therefore language and conversation were impossible to them, and that the result of this was that knowledge was not accumulated, and progressive civilization was beyond their reach. (Printed on page 456).

The Paper was followed by an interesting discussion.

F. T. MOTT, *Vice-Chairman.*

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SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

October 12th.—The Chairman (MONTAGU BROWNE, F.Z.S., F.G.S.) presiding.

Mr. F. W. BOAM, F.C.S., F.G.S., of 2, De Montfort Square, was elected a member of the Section.

Mr. G. WARD read a Paper, entitled "Physical and chemical characters of Wool and Hair."

After pointing out that the difference between Wool and Hair was one of degree rather than kind, and that they were both modifications of the same kind of tissue, Mr. WARD gave a description of the histological features of Hair, and its mode of growth in the skin. Speaking of the outer flattened scales of Wool, it was pointed out how important a part they played in the process of felting, causing the hairs to interlock one with another.

The chemical composition of hair and wool was next given, and in this connection it was stated that the presence of sulphur had caused the adoption of methods for discriminating wool fabrics from those of cotton or silk, plumbite of soda, when boiled with wool, blackening it—forming sulphide of lead, whilst, under the same treatment, cotton and silk remained unaffected.

Much valuable information was given on the chemical processes employed in the cleaning of the fibres, and also in the manufacture of the various trade substances which are obtained from wool, and Mr. WARD showed some samples of products in course of manufacture, which served to elucidate the latter portion of his Paper.

After some little discussion, a vote of thanks, proposed by the CHAIRMAN, was carried unanimously.

November 11th.—A Paper was read by the Chairman (MONTAGU BROWNE, F.Z.S., F.G.S.) entitled "The present and past immigrations of the Grey Phalarope *Phalaropus fulicarius*, (L) to the shores of Britain." (Illustrated by specimens, and by maps of routes of migration.)

The CHAIRMAN said the trivial name of the bird before them was derived from the prevailing colour of the winter plumage in which it visited our shores, and the scientific generic name from two Greek words signifying "coot foot." Its now generally accepted specific name was from the Latin, signifying a coot, in allusion to its "cooty"-like

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feet — an unfortunate combination of Greek and Latin derivatives. This bright little creature—a web-footed, broad-billed sand-piper—hailed from the icy region of the far north, beyond *Boreas*, in fact, ranging in Greenland so far north as 82·30, in Iceland, Siberia, Alaska, the Asiatic side of the Behring Sea, and the more northern islands. In all these high latitudes, really circumpolar, it was found breeding, but at this time it was no longer the "Grey" Phalarope, being attired in a bright chestnut, black, and leaden-grey plumage, with hardly a trace of white or light-grey save on the cheeks and wing coverts. The female was larger and handsomer than the male, and acting up to her superior size and beauty, whilst doubtless mindful of the coming emancipation of her sex, relieved the male of the tedium of courtship, and, as one writer had said, *assiduously* conducted such a trifling matter. Having proposed and been accepted, the female not only allowed her mate to see about the preparation of the "cot," but when the four olive and brown eggs, which were largely disproportionate to the size of the bird, were laid, she further asserted her feminine supremacy by persuading him to undertake the work of hatching and tending the chicks. Both sexes, in addition to being swift and easy on the wing, were graceful and powerful swimmers, albeit nodding the head continuously whilst on the water, after the manner of the moorhen. So buoyant were they, and so pronounced their natatory powers, that they had been observed swimming at sea—probably on the look-out for marine crustaceans—some hundreds of miles from land. When the young were hatched, and the short Arctic summer was drawing to a close, they with their parents departed for less rigorous climes in which to spend the winter, and now, or even before this, the beautiful summer plumage was gradually cast off, and the white and French-grey plumage assumed.

The lecturer then enlarged at some length upon the geological aspect of the matter, pointing out that this change to a garb eminently suited for concealment amidst ice and snow seemed to point to a former environment at variance with its present habit of migrating to temperate and even sub-tropical and tropical zones in winter, and probably from its not using the valley of the Volga as its congener, the Red-necked Phalarope, did, the conclusion might be drawn that the "Grey" was the most ancient bird. Still these were problems which had only recently occurred to the author, who reserved a full consideration of them for the present.

Nearly every year there were one or two stray visitants to the shores of Britain, but in the autumn of 1866 a great immigration took place, when more than 500 specimens were procured. Notable immigrations had taken place in 1869 and 1886, but the number of individuals was far less than in 1866; and during the present year there had also been a great inrush, numerous specimens having been procured in various localities, including Leicestershire.

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Concluding, an extract from the *Field* was read from a personal observation, by a Mr. A. H. PALMER, of these birds swimming in a heavy sea. The writer had been much struck with the graceful activity of the birds' movements, their utter indifference to the uproar and violence of wind and water, and the unerring accuracy with which they dodged the crest of any wave breaking to windward of them. The contrast between the terrific power, confusion and agitation of the sea, driven before a gale, and the tiny, self-possessed swimmers, made the sight as interesting a one in its way as a bird-lover would wish to see.

A short discussion followed, numerous questions being asked and answered.

MONTAGU BROWNE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. J. M. GIMSON, 100, New Walk.

Secretary—Mr. F. S. HERNE, Llanrwst, 49, Mere Road.

The Section meets in the Council Room at the Museum, on the Third Tuesday in each month, at Seven p.m.

January 12.—Mr. C. J. BILLSON, M.A.—"Giants: A Study in Folklore."

February 16.—Rev. J. E. STOCKS, M.A.—"The Roll of Bishop Hugh of Wells (1209-1235) for the Archdeaconry of Leicester."

March 15.—Mr. FERGUS BURDETT.—"The Decay of Rhetoric."

J. M. GIMSON, *Chairman*.

SECTION "D."

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston Rectory, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Highfields, Leicester.

EVENING MEETINGS—The third Wednesday in each month, at the Museum, at 7 p.m.

1892.

January 20.—(1) Exhibition of various kinds of Leather.
(2) Study of the order Ranunculaceæ.
(3) Paper.
(4) Microscope—Dermal Tissues.

February 17.—(1) Exhibition of Mosses.
(2) Study of the order Carnivora.
(3) Paper "On Phenology," by the CHAIRMAN.
(4) Microscope—the Leaves and Peristomes of Mosses.

March 16.—(1) Exhibition of various kinds of Wool and Hair.
(2) Study of the order Rosaceæ.
(3) Paper "On Stings and Poison Fangs," by Mr. F. T. MOTT.
(4) Microscope—Wools and Hairs.

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SECTION "E."

Chairman—MONTAGU BROWNE, F.Z.S., F.G.S., Town Museum.

Vice-Chairman—Dr. F. M. POPE, Prebend Street.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1892.

January 18.—Paper by Mr. F. W. BOAM, F.C.S., F.G.S., on "Cornish Mines and Minerals." (Illustrated by specimens and the Oxy-hydrogen lime-light.)

February 15.—Paper by the Vice-Chairman (Dr. F. M. POPE) on "The hind-limb of Vertebrates." (Illustrated.)

March 14.—Notes and Exhibits by the Chairman (Mr. MONTAGU BROWNE) and others.

MONTAGU BROWNE, *Chairman.*

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TRANSACTIONS

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NEW QUARTERLY SERIES.

VOL. II.

PART XI., APRIL, 1892.

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A. ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Chairman, J. M. GIMSON.
Secretary, F. S. HERNE,
Llanrwst, 49, Mere Road.

D. BIOLOGY (BOTANY AND ZOOLOGY).

Chairman, REV. T. A. PRESTON, M.A.
Secretary, J. J. W. KNOWLES,
25, St. Stephen's Road.

E. ZOOLOGY AND GEOLOGY.

Chairman, MONTAGU BROWNE, F.Z.S., F.G.S.
Secretary, F. R. ROWLEY,
Town Museum.

General Meetings:

Fortnightly, on Mondays at 7.30 p.m. in the New Lecture Hall, Museum Buildings.

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Session 1891-92.

JANUARY TO MARCH, 1892.

GENERAL MEETINGS.

January 11.—Mr. CARL ARMBRUSTER on "Franz Schubert, the greatest song composer of all times."

The LECTURER said the lives of men of genius, especially those of the great masters of the art of music, were generally rough and hard. In many instances recognition and appreciation of their works set in only after the masters themselves were dead and gone. Then monuments were raised in their honour, but during their lives they suffered misery, want, and neglect. The life of the master to whose memory that lecture was dedicated formed a strong case in point. Franz Schubert experienced but little favour or sympathy on the part of his contemporaries. None of those advantages which fate bestowed upon her favourites fell to him. No one thanked him for the gifts he gave to the world. He received not the applause of the masses, the favour of the great, or the support of the wealthy. He sang only to please himself and because he could not help it. And the world had lost him long before it knew what a treasure it had lost in him. But now his name stood high in the roll of musical composers, and his songs lived in the hearts of all true lovers of music. Year after year new additions to these treasures were still discovered, and year after year the genius of Franz Schubert found new friends and new admirers. Even now a part of his works awaited publication, and only future generations would have a complete survey of the wonderful activity of those riches. If fertility were a sign of genius, he was surely the greatest. But they did not estimate him so much by the quantity of his works. It was their importance which had won for him a place among the foremost of his art. He belonged to what was known as the post-classical period, and was one of the first representatives of the Romantic School, which found its expression in the triumph of mind over laws and rules. It could not be denied that he had a strong dash of the classic when they observed the purity and unaffectedness of his creations. His life coincided with what they might justly call the golden age of music. But at heart he was of course romantic, and his world was that of sentiment. Whatever joy or grief might move the human mind Schubert expressed it in songs. Of the sunbeams that illumined

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his music little was to be found in his life. If they examined the long catalogue of his works they did not find a single form of musical art omitted. To all, from the highest to the lowest, he gave his attention, and all kinds flowed from his pen in profusion.

But the great importance of Schubert and his work lay in his wonderful creations in the domain of song. There he reigned supreme. The essence of his nature was purely lyric, and it was his mission to develop that style of art which had been neglected. The song was still in its infancy at the time of the great composers preceding Schubert, which was not to be wondered at. Songs were lyrical poems set to music, and lyric poetry itself was young. Up to the end of the last century lyrical poets were in the habit of expressing general and not individual sentiments. The great composers did not find that depth of feeling which would induce them to direct any large share of their attention to the composition of song. That intimate quality had been from the beginning of the century considered the very essence of lyrical poetry, and seemed to yearn to be wedded to music for its completion. The great poet Goethe had given the impulse to lyric poetry, and it would be unjust not to mention with him the Scotch poet Burns. The impulse once given, a perfect shower of blossoms fell from the great tree of poetry. It was reserved for Franz Schubert to avail himself of this wealth and lead the art of music into a new phase of development.

The lecturer proceeded to discuss the relative characteristics of Schubert, Schumann, and Franz, and said it was the simplicity of Schubert which was the principal point of difference. His naïve spontaneity seemed to be lost in the others, and one did not know which to admire most, his overflowing fancy, or his inexhaustible melody.

Referring briefly to his life, Mr. Armbruster said he was born in January, 1797, and was the son of a poor schoolmaster in a suburb of Vienna. His was an uneventful life, and care and want were his ever faithful companions. He had not the culture of Beethoven nor the education of Mozart and other masters. In his letters there was nothing uncommon, but in music he was able to express anything with marvellous eloquence and power. He was, and remained, great in art, because in art, as in nature, the great, noble, and sublime were not measured by material dimensions, because the creations of art were not weighed by the weights and measures of commerce, but were judged by those transcendental laws of which the human mind possessed the secret without being able to form it into words.

The fact that struck them most in Schubert's songs was their great number. No less than 404 were in print, and it was probable that he composed a great many more, and it was estimated that the number was over 600. They found that over 100 were settings of poems of Goethe, and this settled as to who was his favourite poet. Schiller offered far fewer specimens of lyrical poetry, and his name was only found about twenty times. About a dozen were taken from the antique, which required an entirely different treatment.

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Schubert had a great liking for series and cycles of poems, as illustrated by "Songs of the Mill, "The Winter Journey," and others. Musicians would base their classification of his songs according to the forms of musical treatment. It might be asked whether these songs were known. He would say they were, after a fashion. All lovers of music knew Schubert was a great song composer, and many possessed some of his songs. But did they study them? Did the professional singers sing Schubert's song? How were the public to appreciate songs which they had no opportunity of hearing? If they counted the number sung at the great concerts at the Crystal Palace, St. James's Hall, or at the popular concerts, where the greatest masterpieces of instrumental music were given, he would be surprised if they could find eight of that 400. Was it, then, the fault of the public that they did not appreciate them as they ought? The songs sung by professional singers were, in nine cases out of ten, the veriest rubbish, most vapid, meaningless, insipid, and commonplace. The singers said the public did not care for good songs, and they must sing down to the public taste. He knew they were mistaken. He knew that the people who attended lectures always liked good songs. One would think that those audiences at the Monday and Saturday popular concerts, however, who appreciated high-class instrumental music, would enjoy a classical song, but it was a fact that they sat cold and emotionless while Schubert was being sung, and went into raptures over a stupid ditty if sung by a favourite vocalist in a coquettish style. It was a matter exceedingly difficult to explain, and he did not pretend to have an explanation to offer, if they did not assume that the greater part of those audiences did not go because it was fashionable and because they did not care at all about the music.

In conclusion, Mr. Armbruster related the story of Schubert's death in 1828, and referred to his personal characteristics.

The lecture also partook of the nature of a concert, as a number of illustrative examples of Schubert's songs were rendered by Miss Pauline Cramer, Mr. Armbruster accompanying at the piano. The programme consisted of the following songs: "The Odious Colour," "Jealousy and Pride," "The Carrier Pigeon," "Group from Tartarus," "To the Lyre," "The Dwarf," and "Gretchen's Prayer to the Madonna" (Goethe's "Faust").

January 25th.—Rev. C. C. Coe, F.R.G.S., on "King Lear."

The lecture took the form of comprehensive and thoughtful analysis of the characters of the principal persons in the play, and of the motives actuating them in the progress of the plot. Speaking of the part of the fool, the rev. gentleman said it was for a long time omitted from the representations of the play. It was evidently considered to be too comic to be acted with the agony of Lear. But this arose from a wrong conception of the character of the fool, for the two-fold aspect of a jester's life was thoroughly human and real. Macready was the first actor to

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include the part in a performance of the play in 1838. Referring to the tragic conclusion of the play, and the attempts by some playwrights, particularly that of Tate, to alter the plot and make it end happily, the lecturer said if anyone ought to have known how it should end Shakspeare ought, and if he had thought well he would have been perfectly at liberty to bring it to any other conclusion. A peaceful ending would not have been altogether appropriate to such a play.

February 8th.—PROFESSOR A. SMITHELLS on "Ozone."

The LECTURER said that the subject of his remarks that evening was one of interest to the people at large and of particular interest to the chemist. He hoped to give them some general information about ozone, and at the same time to illustrate the particular methods of investigation adopted by the chemist. Ozone was a substance well known to the populace, and he often heard much more confident pronouncements concerning it than he heard from his scientific brethren. It was first detected in the year 1785, when a peculiar odour was noticed in the neighbourhood of electrical machines at work, and not only that but the air in which the smell was perceptible was found to have some peculiar properties, one of which was that it had a particular action upon the metal quicksilver. Nothing further was done with respect to ozone until 1840, when the chemist Schönbein found the same peculiar odour during the decomposition of water by electricity. He noticed the peculiar smell, and he gave the substance the definite name of ozone. The smell was likened to that which was perceptible after lightning and was not unlike that of chlorine, though there was a distinct difference between the two to a man of chemical experience. Schönbein also found that the quantity of this substance which was formed depended somewhat on the temperature—the higher the temperature the less was formed, and the lower the temperature the more was formed. As it would not be possible for the audience to detect the ozone he might make by the smell he would select another test. He would take a mixture of starch and potassium iodide, and would dip slips of blotting paper in it, and expose them to the ozone he would produce. Whenever ozone came into contact with that mixture it turned it to a shade of blue. Professor Smithells proceeded to generate ozone by passing a current of electricity through oxygen. He applied the test mentioned with the result that the slips of paper were marked with a deep blue. Next he illustrated other means by which ozone can be produced by the exposure of a stick of phosphorus in moist air, and by the action of a hot rod plunged into a jar in which ether had been evaporated. The test answered perfectly in each case. Ozone was also produced when substances of the nature of turpentine were exposed to the air. The salubrious effects attributed to pine forests, and the various disinfectants in which products of turpentine formed a constituent part, had been put down largely to the generation of ozone. For all he knew the supposed

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beneficial effects of eucalyptus oil as a preventive against influenza—though he should be sorry to affirm that the supposed effects were real—might be laid to a similar cause.

Another feature of ozone, in addition to its smell, was that it was a powerful bleaching agent, and it had been used for bleaching on a large scale. A third feature was that ozone destroyed what chemists called organic matter, by which was meant substances of vegetable or animal origin. The lecturer proceeded to demonstrate these two properties of ozone, showing the bleaching action upon a solution of indigo, and its action in destroying organic matter, by means of a piece of india-rubber. The Professor further proved, by another experiment, that ozone was destroyed by heat.

Proceeding with the history of ozone, the lecturer went on to say that in 1853 an Irish chemist named Andrews took up the study of ozone, and came to some important conclusions. He found that it was exactly the same whether prepared by passing electricity through oxygen or by means of the phosphorus or ether. More important still, he found that it was not a compound body, but that it was simply oxygen, though oxygen somehow or other altered. That was a very remarkable conclusion to come to, though perhaps it might not strike the minds of those uneducated in chemistry as it struck the mind of the chemist. When they came to think about the matter, however, they would see that it was by no means easy to explain how it came about that they could have two substances—oxygen and ozone—with different properties, one colourless and inodorous and the other possessing a distinct smell; one having a peculiar effect on the mixture of starch and potassium of iodide, the other having no effect at all—it was not easy to explain how they could have two substances of different properties, and yet that both should be of exactly the same composition. In conjunction with Professor Tait, Mr. Andrews in 1860 discovered also that when oxygen was converted into ozone it shrank in bulk, and that fact was subsequently confirmed. Having illustrated this by a very interesting experiment, the lecturer went on to say that chemists had accepted the conclusion that ozone was a substance formed from oxygen by a process of condensation or shrinkage. They had next to explain the way in which this change was effected. He had not time to go over the various researches which had been conducted in connection with this point. The explanation which was given rested on the theory that all substances were composed of small particles called atoms. So exceedingly minute were these atoms that they could never hope to see them. If they admitted that oxygen was composed of these tiny atoms, they would understand without any difficulty how they might get oxygen converted into ozone. The theory which was at present universally accepted was that the difference between the two was as follows—each little particle of oxygen consisted of two atoms, and each little particle of ozone consisted of three atoms. When oxygen was converted to ozone they simply changed the grouping of the substance from atoms in pairs to atoms in triplets.

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They could easily understand that if they arranged the atoms in different groups they might get a substance possessing totally different properties chemically and physically from the original substance. The alteration in bulk was accounted for in the same manner.

Having illustrated by means of grouping some balls the economy of space secured by disposing them in groups of three compared with groups of two, the lecturer said he thought they would find it impossible to imagine any other explanation of the difference between oxygen and ozone than that he had stated. He wished to say a few words concerning the occurrence of ozone in the air. As he had stated, the public often expressed much more decided opinions concerning ozone and its presence in the air than experienced chemists ventured to state. When he made that remark he was thinking of the man who, going fresh from the town into the country, went out in the morning upon the hills, and was full of satisfaction as he took deep inspirations, rejoicing at the thought that he was getting large quantities of ozone into his lungs. He believed that the popular impression was that the amount of ozone which existed in country air was simply prodigious. It must be startling to such a gentleman as he had referred to to hear in the first place that ozone was a poison, and that in the second place it was extremely doubtful whether it ever occurred in the air at all. Both these statements, however, wanted explanation. When he said that ozone was a poison he meant pure ozone. The inhalation of pure ozone would produce very grave symptoms indeed. But ozone was like a good many other substances—when sufficiently diluted it might prove beneficial instead of harmful. This was undoubtedly the case. When ozone was diluted with air, or when the air contained ozone in only a small proportion, that air was undoubtedly of an excellent and superior quality, chiefly for this reason.

Ozone, as they had seen, destroyed organic matter. Organic matter nearly always existed in the air in small quantities, and it was that matter which was largely the food of those disease germs of which the human race was in so much dread. Where there was ozone they could not have organic matter, and where there was no organic matter there would be no bacterial life. If they could be sure that the air at any place contained ozone they would be justified in coming to the conclusion that that air was healthy. And not only did ozone destroy the food of disease germs, but it poisoned the germs themselves, so that if they could only get ozone into the air it would be a good thing. The question was—what were they to rely upon to indicate the presence or absence of ozone in the air? Many people thought that they could detect it by the smell. He knew of people who whenever they went to the seaside and smelt decaying seaweed rejoiced in the presence of ozone. The odour of seaweed and ozone were not altogether unlike, but they might be sure that ozone was never present in sufficient quantity to be recognisable by smell. There was the test of the iodide of potassium, but that was not infallible. There were other things which would produce the same

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effect upon it as ozone. The oxides of nitrogen would turn paper steeped in it a blue colour, and so also would hydrogen peroxide. Therefore they wanted some further evidence that ozone was present in the air.

The lecturer proceeded to have thrown upon the screen a view of an apparatus which Andrews used for that purpose, and he described the experiment. It proceeded upon the fact that heat destroys ozone. The chemist first passed the air which he was testing through the apparatus, and the blue effect on the test paper followed. He then heated the bulb through which the air traversed, the oxides of nitrogen being unaffected by heat. The heated air, however, gave no result on the test paper, showing that in the first instance it was ozone present in the air which produced the blue tint. Within the last three or four years, however, a French chemist of distinction had made a most elaborate inquiry into the relationship between the substances mentioned which affected the starch and iodide of potassium in the same way. He claimed to have accurate means of discriminating between them. He had tested the air in different parts of the world for ozone, and he had failed to get any indication of ozone in the air under any circumstances whatever. He (the lecturer) wrote to the secretary of the Meteorological Office asking that gentleman if he had any information he could give him on the subject. But the secretary replied with a letter which betrayed in a marked degree his anxiety not to discuss the question. None the less for that, regular observations in different parts of the country were made respecting the presence of ozone. The method was a very simple one. Little strips of paper which had been immersed in the mixture he had shown them were exposed to the air for a certain length of time. If ozone—or anything answering to the same test as ozone—was present the paper developed a blue tint, and by the depth of the tint the amount of ozone was measured.

A scale of the different degrees of colouring had been prepared. He had with him two or three envelopes containing these ozone papers which had been exposed to the Leicester air at Mr. Hopps's house (Lea Hurst) and also in Friar Lane. The professor exhibited the papers to the audience, and all of them were found to be of perfect whiteness, none bearing the faintest indication of blueness. He went on to remark, amid some laughter, that he should be sorry to generalise from those papers—he might have been particularly unfortunate in the choice of the days for exposure. At Leeds, in the suburbs where he lived, he had been able to get an indication corresponding to No. 4 on the scale. But he did not wish to attach too much importance to these observations. It was not proved that the colour which might be produced was due only to ozone, and the colouring was not a safe criterion. The common supposition was that ozone abounded particularly at the seaside, but careful experiments showed that there was no more of it in seaside than in country air—or rather no more of those substances which possessed the same properties with regard to the test-paper. As to the chemistry of the subject, it was now perfectly clear what ozone was. So far as its

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occurrence in the air was concerned, and its effect on the salubrity of the atmosphere, they were still very much in the dark.

The lecture was illustrated by a number of experiments, all of which were completely successful, and also by means of views thrown on the screen.

The CHAIRMAN said he believed the results which the Professor had stated with regard to the tests for ozone in Leicester air exactly corresponded with similar experiments made by Mr. James Plant in past years. Mr. Plant always told him that he could never get any indications of ozone in Leicester air, but he had been able to get indications of its presence at the Charnwood Forest and very prominent on the sea-shore at Skegness.

February 22nd.—Dr. ALFRED HARVEY (of Birmingham), on "Micro-Organisms and Disease."

The LECTURER, at the outset, said the assertion that "big fleas have little fleas upon their backs to bite 'em, and little fleas still smaller fleas, and so *ad infinitum*," was one which, in substance if not in form, dated back many centuries; but the definite knowledge of those minute organisms which had been of late so much before them, as playing a prominent part not only in the production and spread of disease, but in many beneficent processes of nature as well, had followed the invention of the microscope and its application to the solution of scientific problems. It was true that Aristotle believed in the existence of infinitesimal animals, and that Lucretius, in his wonderful guesses at truth, anticipated some of the teaching of the most modern of sciences, but the first definite knowledge of the existence of micro-organisms dated only from the closing years of the seventeenth century.

Dr. Harvey proceeded from this point to trace historically the more important discoveries relative to the existence of bacteria in their varied forms, and to give some interesting details as to their size, appearance, and general characteristics, describing them broadly as rounded, rod-shaped, thread-like, and spiral bodies, and as the lowest forms of living body known. Although possessing the power of movement it was now generally recognised that these little organisms were vegetable, belonging to the class know as fission fungi.

Having dealt at some length with the conditions of life of various species of microbes, the lecturer went on to say that as to their distribution through nature, they were almost everywhere. They were, however, most numerous in low-lying lands and valleys, especially where people were congregated, or where there was decaying animal or vegetable matter. Mountain air contained very few organisms, while sea-breezes were practically destitute of them. In water they were very numerous, and especially in stagnant or surface water; underground waters were very free, and running streams, unless contaminated by sewage or other organic matter, were fairly so. A water with less than 4,000 microbes in

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a cubic inch was considered a remarkably pure one, so that the probability was that in drinking a glass of average water a person swallowed at least 50,000 living bodies. If a little organic matter was mixed with the water the rate of reproduction was enormously increased, in fact a small quantity of sewage tainted with the excrete of typhoid fever would soon render poisonous a whole reservoir. The study of the phenomena of fermentation led to the discovery and proof that many diseases were caused by micro-organisms, and as the outcome of those researches they were taught that the cause of miasmatic, infective and contagious diseases must be looked for in fungi or other living organisms. Koch and others described micro-organisms as the cause of various diseases, especially cholera and typhoid fever, but it was left for Pasteur to obtain the necessary proofs.

Dr. Harvey gave an interesting resumé of Pasteur's labours in this direction. The enthusiasm aroused by Pasteur's publications led many scientists to work upon his lines, and among them was Sir Joseph Lister, whose eminently practical mind had revolutionised surgery throughout the world. Having accepted the theory of putrefaction Sir Joseph Lister immediately looked for its practical application, and he was not long in arriving at the conclusion that erysipelas and other kindred diseases which wrought such disastrous results in the surgical wards of their hospitals were due to the entrance of disease germs into the wounds, and that the highest aim of the surgeon was to keep them out By careful washing and suitable disinfectants or germ destroyers he sought to perform all operations and dress all wounds in an atmosphere that was absolutely devoid of living organisms. The result was marvellous, and even his most determined opponents were, though unconsciously, greatly influenced by him. Under Lister's influence surgeons now treated daily, and with impunity, with the body cavities and large joints which it was formerly considered certain death to touch; mortality had been much diminished, and the rapidity of cure had been accelerated.

It was Lister's teaching, too, and his wonderful results, which primarily led to that great development of scientific study in Germany of which the modern science of Bacteriology was the direct outcome, and which had taught them practically all they knew of the production of disease by living germs. The channels by which bacteria entered the human body were various. Many, such as the germs of typhoid fever and cholera, entered by the alimentary canal, where their chief symptoms were produced; others by the air passages—the tubercle bacillus generally, the measles and influenza germs probably entirely. Another channel was inoculation through wounds, tetanus being invariably produced in this manner. The great vehicle of the poison was the air, and after that drinking water. The first disease which was absolutely proved to be of bacterial origin was anthrax—a disease which man shared with the lower animals.

The cholera microbe had been much sought after, but was only positively identified six or seven years ago by Koch. The usual vehicle

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was water, and the best preventives were sanitary cleanliness and a pure supply of water. The microbe of typhoid fever was also conveyed chiefly by water. There was no reasonable doubt that it was the cause of the infection, but the full proof had not been achieved owing to the fact that typhoid fever was not communicable to the lower animals.

About the tubercle bacillus the most heated warfare had raged on both parties—the supporters of the bacterial origin of the disease and those of the old pathology had had to abate some of their pretensions. It was at any rate universally recognised that the presence of the bacillus was not mere accident, but on the other hand that, in order that it may have any power over the organism. the predisposing causes must be present. Bacteria had been described as the cause of smallpox, scarlet-fever, measles, pneumonia, and many other diseases, but the proof was not perfect.

In conclusion the lecturer said it might naturally be asked what was the practical outcome of this bacteriology. It was scarcely fair to ask a science still in its earliest infancy for results, yet there were some already. It had taught them the difference between real disinfection and that sham disinfection so often employed, and which was only a fool's paradise. It had already been of extreme benefit to agriculture by means of protective inoculation; it had held out the best hope they had yet had for the relief of that dreaded malady consumption, and indirectly it had led to the best treatment—the only treatment—for hydrophobia. This it had done already, but its prospects for the future were immeasurably greater. He fully believed that in the near future those diseases which they grouped together as zymotic, and which destroyed about 70,000 lives annually in this country alone, would be relegated to that limbo to which small-pox was already rapidly vanishing.

March 7th.—Professor MATESDORF on "Old Irish and Anglo-Saxon Art."

Professor MATESDORF said that they were hearing now a good deal of Ireland, but it was more about her present political position than her art. Comparatively few people were aware that Ireland could boast of an epoch of art life at a time when the rest of Europe was barbarous. A year or two ago, with a view of interesting the public in our national museums, lectures were given at the London University, and the students were afterwards taken through the British Museum. He contributed his share to these efforts by explaining the old illustrated books, principally of Irish origin, and which showed their old art life at its best. These old Irish MS. books were now very rare. He could not show them any actual specimens, but he would throw photographs of them on the screen. The Irish Celts had left other traces of their art life besides these miniatures and illuminations.

In illustration the professor showed a fine example of goldsmith's work in the shape of a shrine of St. Patrick's bell. The shrine was

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composed of brass covered with a greath wealth of silver filigree, crystals, and precious stones.

The second specimen was the Tara brooch, which was picked up by a poor woman upon the seashore. It was made before the year 700, and it was covered with enamel work—an art which was entirely lost everywhere else in Europe.

But the chief remains were not metal work, but miniatures or illuminations in books. Book illustrating seems to have begun among the Romans, and its first form was the enlargement of the first letters, and writing them with red ink. Ovid when banished from his country poured out his lamentations, and in the first of his elegies he said, "Ornaments are not fit for the mournful, and no more will the first line of the book be marked with minium"—which was red lead. Dante in his great poem met an artist in the Inferno, and asked him, "Art thou the man celebrated in the craft which they call in Paris illuminating?" There they had an early mention of Paris as the capital of the arts, and the first known mention of the word to illuminate. The oldest known name in the art of book illustration—an occupation which had always been a favourite domain of women—was Lala, who lived about a hundred years before Christ. When Rome fell, and hordes of northern savages camped on the ruins of this once splendid civilisation, there was for Western Europe at least but one country where the holy lamp of art was kept burning, namely, Ireland.

At a very early date there were in Ireland churches and monasteries where the votaries of the mind copied the Psalms and the Evangels and decorated them lovingly. To such monkish books he would ask their attention that evening. They were made of vellum or parchment, that was of calf or sheep skins, and the extraordinary feature about them was the ornamentation.

To the Celtic as to the Germanic races the taste for decoration was innate. The Irish especially were and are an imaginative race. As for coloured ornament, the first object was presumably the human body, which was tattooed. He had no doubt that the first illuminated MSS. were neither on calf-skin nor on sheep-skin, but on the skin of art-loving, vain, prehistoric Irish men and women. Centuries before St. Augustine converted our barbaric forefathers, already in 209 the new faith had come to Ireland. It took root firmly in the fifth century through St. Patrick, and then, whilst the Roman Empire crumbled away and all civilisation seemed to perish, a remarkable art life arose in Ireland—music, metal-work, sculpture. It was said that pictures existed in the fifth century in the church of Kildare, and that Dagæus about the year 600 cast 300 church bells, made 300 crosiers, and wrote 300 richly-ornamented MSS. The Irish missionaries travelled far and wide, and roved all over the Continent converting and civilising. They wore long flowing hair, tattooed their eyelids, carried each a book in his satchel and a long staff in his hand, and they had a noisy way of talking and gesticulating. It was strange how habits and characteristics such as

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these could be traced back for hundreds of years. Everywhere these Irish monks had left noble traces, and some of the earliest books of European Christianity. They had the start of the English and French, who did not yet exist, and of the Germans, who were barbarians, but not of the Italians and Greeks.

The professor proceeded to speak particularly of some of the Irish saints, mentioning St. Columba, St. Columbanus, St. Lievin, St. Gall, St. Methodius, and the hermit St. Marianus.

Having spoken of the men who produced the books, he threw upon the screen many and interesting specimens of their work. The first picture was that of an enlarged and illuminated letter "L," the initial of the word liber. The most characteristic feature was the spirals, which might be said to be peculiar to the Celtic art, and therefore a national ornamentation. This design was probably suggested by the fibula, which was a brooch or metal wire needle forming a safety pin. These pins were a very old invention, and man was very early a safety-pin-making animal. The spiral might also have been suggested by many shells. In the originals the spirals were quite small, and always so correct that it became a mystery how human eyes and hands could execute them. They were no doubt freehand drawing.

The lecturer next showed a page containing a whole phrase illuminated: "Liber generationis Christi." He pointed out a peculiar pattern which he remarked was also found on sculptures of Nineveh, though there could be no connection between the two. The next step in book illumination was to have one page entirely taken up with ornamentation, and several specimens of such pages were shown.

The professor dwelt particularly on the "trumpet pattern" which some of them disclosed and also upon the interlacing work. The latter work occurred in other countries, among them Sweden, Denmark, and Iceland, but in its highest development the art was Irish.

The lecturer made some interesting suggestions as to the probable origin of this interlaced ribbon-work. Max Müller in his book on the "Science of Thought," claimed to have traced all the words of the language to some 200 root forms, and each of these roots denoted some simple action. One of them denoted plaiting, which was undoubtedly a very ancient occupation. Attention was also directed to the animals' heads and features which were introduced into the illuminations, all of which were extremely quaint. Serpents, lizards, and dragons were frequently made use of, and the dog stood for the evil spirit, like Cerberus at the gates of Hades. The peacock was an emblem of immortality, and the fish had also a sacred significance.

Next the grotesque representations of the human body were illustrated and commented on. They came to them with regret after the splendid ornamentation and illustration disclosed in the other pages to which he had referred, for the Irish did not excel in them. They never imitated nature; but even in this there was a certain meditative turn which was peculiar to Northern nations. Their figures were idols, and

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the monks never appeared to have noticed their hideousness. The simple plan of looking at the human body before and whilst drawing it never seemed to have occurred to them. But things were generally wrong at the beginning. Renan had said in his vigorous style that man was a fool during many thousand years after having been a beast for many other thousands of years, and he had now scarcely ceased being a child.

Professor Matesdorf concluded his lecture with a brief reference to Anglo-Saxon Art. He showed some sketches illustrating Biblical events which appeared in an old English Psalter produced at Winchester of the date of about 900, and which was now at Utrecht. He pointed out the freedom and absence of conventionality which distinguished the figures, and remarked that this anonymous artist of the Utrecht Psalter might be said to begin the role of British art, which included Hogarth, Gainsborough, and Reynolds, and to which modern days were adding. This vitality in the old times to which they had been referring in Ireland and Great Britain, and which occurred at a period when the rest of Europe was barbarous, and when art, if any existed, was simply in slavish submission to the Byzantine school, and not yet "rightly struggling to be free," was an interesting and a little known fact.

March 21st.—Mr. A. P. Moore, B.C.L., on "The Universities and National Education."

The Lecturer, after some introductory remarks, said that the universities were now striving to influence the main current of the life and regulate the education of the nation. Never before had the whole subject of education engaged so large a share of public attention. Twenty years ago the State recognised the duty of providing every citizen with the elements of knowledge. More lately the importance of technical education had been pressed upon the legislature by urgent practical necessity. England was the great workshop of the world, and Ruskin had turned out to be right. The great civilised invention of the division of labour could not secure good work. They could not with impunity neglect the soul of the workman nor degrade him into a heap of mechanism. Only intelligent labour could ennoble the workman. Now that the whole civil and municipal organisation of the country had been transformed, and public duties were thrown on every man, the need of a national culture was the more apparent. The printing-press did not act mechanically upon the mind, neither did the mere multiplication of volumes carry enlightenment through a people.

The influence of the spirit of the teacher upon the student was needed now more than ever when we were embarrassed by the ceaseless accumulation of masses of printed matter. It might be that the Government would ere long undertake the task of organising as a comprehensive plan the whole scheme of national education. We had only to look across the Channel to see a completely articulated and symmetrical

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academical system possessed by France to meet the requirements of modern life, and welding into one whole primary, secondary, and higher education under one head, the Minister of Instruction, who was also head of the Universities of France. No scheme in England, however, could hope for success which impaired the dignity or independence of the universities. The most obvious method of encouraging higher education here was, by State aid, to encourage the development of University Extension Colleges affiliated to the bodies already privileged to grant degrees. And this principle had already been recognised.

The university extension movement had been in progress now for some 18 years, and those best qualified to judge claimed for it an extraordinary success. It is said that there were 40,000 students attending the courses of lectures. He could speak with no special knowledge of the past of the university extension movement, still less could he venture to prophesy its future. But it did suggest to him a reference to the first two centuries of university history in this country.

Mr. Moore then proceeded to give an extremely interesting sketch of the social and intellectual life of the universities in early years, and to "draw a parallel between the days when travelling students begged their way to the feet of the master and the days when the railway brings the itinerant teacher to the door of the student." He then went on to say that reforms initiated by the universities themselves and carried further by Parliament had effected a transformation. The universities had been revived at the expense of the colleges, and reinvested with teaching power. As the religious tests had been repealed, so also all outward distinctions of rank among the students in dress and diet had been done away with. The result had not been wholly good. The average expense of a college education had been increased. The class from which the sizars and servitors of old days were drawn was now almost unrepresented at the universities. This class could not gain scholarships because these were rewards to be won by public competition, and went to the best prepared youths from school, and scholastic equipment cost money. It was the knowledge of this and the remembrance of the fact that the indigent scholar was the first care of the pious college-founder that quickened the activity of the authorities and members of the universities in creating and sustaining such institutions as the settlement of Toynbee Hall and Oxford House in East London and the movement called the university extension movement. The poorest artisan who attended lectures at Toynbee Hall was not more poor than was Edmund Rich, the Oxford student who learnt his grammar at Oxford and begged his way to the continent for higher instruction, and afterward became Archbishop of Canterbury. It was the pressing need of the age to give the masses the leavening of culture and political education. The great question was how? Were they to impose on town and county councils the duty of training the men as capable citizens as well as of teaching women to nurse and to cook? Should they see the day when peripatetic teachers were sent through town and village to instruct the electors like the

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students of Milton's ideal academy in "the beginning, end, and reason of political societies, that they may not in a dangerous fit of the commonwealth be poor, shaken, and uncertain reeds." Or were they to found universities on the pattern of the modern university of Athens, where at this moment free education was provided for every Greek? It was said that a crowd of Greeks from every quarter congregated there, spent their days in menial employments, keeping their lecture-hours free. They lodged in the humblest rooms, clubbed together their small earnings and invested them in the purchase of lights and text books which they had in common. This was indeed a bringing-back to the modern world of the mediæval universities. The conditions of life were so different that the experiment was a dangerous one. The labour market for scholars was overstocked. They did not need to found a number of halls for poor scholars at Oxford and Cambridge, and to throw upon the world a number of learned idlers with barren degrees. What they wanted to do was to breed philosophical working men of the type of Felix Holt, and to give some tincture of a liberal education to the classes to whom residence at the university was an impossibility. Mechanics' institutes, working men's colleges, and such like agencies had borne their natural part, and something more was called for. The aim of all instruction, it had been well said, was to teach a man to know himself and the world.

Looking at the whole subject of national education, the education of the upper classes was deficient on the side of science and knowledge of laws that governed the material universe. But the education of the lower classes was still more lamentably lacking on the side of literature. The true aim of a liberal education was to refine and strengthen a man's mental powers, and give him intellectual eyes to see with, and to train him in a philosophical habit of mind to see things in their true relations, and to give him some idea at least of the whole circle of knowledge. But if they were to choose between literature and science, literature was infinitely the more powerful as a civilising agent. The knowledge of man, his works, the philosophy and history, the poetry and art that his spirit had created, elevated and inspired as no other knowledge could do. Socrates was one of the sovereign educators of the world. He taught man to look into his own breast, to know himself. The secret of his influence lay in his power of throwing fresh light upon vulgar notions about life and conduct, and leading men to look beyond blind prejudice and hollow conventionality and seek for an intelligible law in things. Ruskin and Carlyle had done the same work in our own day. If literature or science was to be treated as education and not as recreation, a careful grounding in the grammar at any rate of Latin and Greek was needed for the one, and a thorough drilling in mathematics for the other. Could this preliminary training ever be secured to that class to which they most desired to give a leavening of higher education without local intellectual centres where systematic instruction could be obtained at a cheap cost? Our municipal organisation had been reformed till it had become a powerful engine for the promotion of local objects.

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Was it an idle dream to hope that the populous city of the future might contain with a swimming-bath, a fencing-school, a gymnasium and a college with laboratory and scientific apparatus as well as a free library and a park, so that every citizen might be able to pursue his mental and physical development on the lines of his special aptitudes? Vast sums had been spent on sanitation in order to observe the laws of bodily health. Surely to purify the taste and increase the intellectual health of a nation should also be the object of a statesman.

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AN ENGLISH VILLAGE IN THE THIRTEENTH CENTURY.

By A. H. Bennett, LL.B. (Read before Section "A.")

From the dawn of civilization down to the close of the Middle Ages the village was in all European countries the pillar on which the State rested. It was a highly-organized community—the unit for administrative and economic purposes; for the administration of justice, criminal and civil; and often for the collection of revenue. In Saxon England it was a "tun" or "ham"; in Norman England it was a "vill" or "township"; in early France a "villa"; in Germany a "heim." The kinship of the words shows how nearly allied were the institutions, the Saxon "ham," the German "heim," the later English "vill," and the French "villa."

Russia and the Sclavonic countries, so many centuries later in developing, have to-day almost identical institutions—in Russia the "mir," in Slav countries "the house family." To go yet further afield, many Aryan races in India are organized in village communities.

The thirteenth century has been chosen as the best period for an English village, because the village community was then unbroken in organization, and we have full records of its working. In the middle of the fourteenth century the Black Death, that awful plague from which probably one-third of the population died, tore asunder the whole economy of the country and shook the village communities to their foundations. They never recovered from the shock. From that time the organization of the village community gradually broke up, until, for all practical purposes, it had become, in the reign of Elizabeth, but a shadow of its former completeness. The criminal jurisdiction of its court was absorbed by the justices of the peace, the civil business of its court was absorbed by the Queen's courts, and the power of the village officers became less as communications were improved and men's thoughts became wider. The agricultural system characteristic of the village community died harder; not until the Enclosure Acts of the last century was its power broken, and a few obscure instances remain even to-day. There is, or was until lately, one at Castor, in Northamptonshire.

Some histories speak of the feudal system, knights' fees, manors, wards and scutages as if the whole land system of England was revolutionized after the Conquest. It was not so; the tenure upon which the actual tillers of the soil held was not changed by Norman laws—the feudal apparatus weighed heavily on the great men of the social hierarchy, but on the little men not at all. The feudal system, so far as it developed in England, was a superstructure reared upon the village communities. They were unaffected by the feudal system, and remained the foundation of the economic system of the State. The "manor" was not in the least a feudal novelty, it was, in its perfection,

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a village community—nothing more or less. It existed in Saxon times, when it was called a "tun" or "ham." It has been defined as "an estate with a village community in villenage upon it under a lord's jurisdiction."

Now let us turn to the English village as it looked. It was very different in many respects from the ordinary village of to-day. It was a group of small homesteads, each with its stabling, rickyard, and toft, or croft, *i.e.*, a small grass field. The houses were not scattered about each in the middle of the land its occupier cultivated, as to-day, nor were they a number of houses facing a long straight street. You may here and there find a village still on the old plan, with houses dotted about close together, full of little streets and blind alleys, but they are scarce. The plan was most like a Swiss village, where the châlets are all close together and so mixed up that they look as if they had been rained down from a giant pepper-box. Round the village were the open fields cultivated by the villagers.

The houses were usually built of mud with thatched roofs, generally with one room downstairs and one room above. Few or none of these houses are now left, but the next stage of development, where all the bedrooms are in a string, opening out of one another, is still occasionally to be met with. The windows were usually plain unglazed openings in the wall as we know from the fact that a favourite method of stealing was by lifting things through a window at the end of a hooked stick. That the walls were generally mud we may infer from the fact that when a man is charged with burglary he is said to have dug through the wall of the house.

The grass land lying round the village was usually divided into pastures where the villagers sent their beasts to graze in common and open meadows, which were divided not by fences but by marks, and, except during the time they were laid for hay, were grazed in common. From Candlemas to Midsummer these meadows were kept closed, and at Midsummer each man mowed the hay on the strip which belonged to him. If you walk along the towing-path between Aylestone and Blaby you will see in a meadow a number of stones laid at regular intervals, which were no doubt the boundary-stones before the land was enclosed.

The method of cultivating the arable land was the most remarkable. The arable land belonging to the village was usually divided into three large fields. These fields were subdivided into a great number of acre and half acre long narrow strips of a convenient size and shape for ploughing. A number of these strips in a row were called a furlong. Each villager included in his holding land in each of the three fields, and in each field his holding was not together, but if, as was a frequent occurrence, he had five acres in each field, each five acres was divided into from eight to sixteen or twenty different strips lying scattered over the fields. Each man sowed his own strips of land with corn and reaped his own harvest. From harvest to seed-time the land was thrown open to the cattle of the village to graze as they could in common.

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You will easily see that this system compelled the cultivators to adopt the same system of husbandry, and this was regulated by custom. Each field in turn grew "tilth grain," "etch grain," and the third year lay fallow. Thus there was always one field fallow. As the holdings were so mixed up they could only be cultivated under the strictest regulation. If one man began his harvest before the others he caused them damage. The cultivation was regulated by "bye-laws" made by the jury at the manor court, and the observance of these bye-laws was looked after by the "reeve" who was elected by the villagers.

The land in the village fields was divided into holdings called "yardlands" or "virgates." Each yardland consisted of a number of the strips of arable land above mentioned, scattered all over the common fields, so many in each field. By this means the good and the bad land were equally divided and one yardland was as good as another. Most of the villagers held yardlands averaging fifteen to twenty acres, but others held half and quarter yardlands, and there were a few cotters holding six acres or so, but there was no large landless class like the modern labourers. Each holder of arable land was entitled to graze a proportionate number of beasts on the common pasture.

There is strong reason to believe that at an earlier date the members of the village community did not own the same land year after year, but that the strips of land were redistributed annually. If this custom ever existed it had ceased as to arable land in the thirteenth century, though in some places, for many years afterwards, meadow land was redistributed each year for the hay harvest and called "dole meadow."

The demesne land of the lord of the manor, which he kept in his own hands, also consisted of strips mixed up with the others in the common fields.

The demesne land was to a great extent cultivated by the labour which the tenants were bound to furnish as part of their rent. The lord found the ploughs and the oxen and the tenants did their accustomed labour. An anonymous book of the reign of Edward I., called "Fleta," gives us details of the management of the lord's demesne and the duties of his officers who overlooked it, but no authentic account of the system of cultivation in common, which we know prevailed among the tenants, has come down to us. The ordinary plough team consisted of eight oxen, and we know from Domesday that the average village contained about one plough team for every four yardlands, or eight ox gangs. The presumption, therefore, is that each holder of an ox gang contributed one ox to the plough team, and larger holders in proportion. Four yardlands were called a ploughland, and presumably the owner of a ploughland provided a full team of oxen.

It will be seen that the whole village was an agricultural community and based upon the soil. There were no trades, only sufficient handicraftsmen to make the village self-dependent—a blacksmith, a carpenter, a miller, a baker, and a brewer were sufficient. These craftsmen, nevertheless, usually held land in addition.

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The account I have given above of the open field system of husbandry impresses one, as a system contrived to give the minimum of result with the maximum of inconvenience. It was a system impossible to work except in a carefully-organized and regulated community. To show the extent to which such a village was governed, I will give a list of officials who were usually appointed in a village of any size:—The reeve, a sort of agricultural superintendent for the whole village, who enforced the bye-laws for the due cultivation of the open fields; the cowherd, the swineherd, and the gooseherd. These were servants of the village, paid by a levy on the inhabitants. In the morning, at dawn, when the swineherd drove out his charges through the town to the common or forest to feed on the acorns, he blew his horn, and every inhabitant let out his pig to go with the rest. In the days of open commons, when cattle were turned out in the morning and driven in at night, the herdsman went with them. The tithing-man, sometimes called headborough or thirdborough—the chief frankpledge—who was responsible for the peace of the village. In later days the tithing-man became the parish constable The pindar, who kept the pound or pinfold. There was also the parish priest, too often the vicar of one of the great religious houses, who themselves drew the great tithes, leaving the small tithes, of little value, to the vicar. On these, the produce of his glebe-farm, and the customary Easter and other offerings, he managed to exist. The priest was a peasant and a husbandman like his neighbours, cultivating the yardland belonging to the Church for his own benefit. There was also a parish clerk (a layman), who, in addition to his parish duties, filled a useful post when writing was a rare accomplishment. He could prepare a receipt or a conveyance of land, as Chaucer says, of his Parish Clerk, Absolon.

> "Well coud he leten blod and clippe and shave,
> And make a chartre of lond, and a quitance."

It may be mentioned incidentally that a clerk who could make a charter of land was a necessity in every village. One is surprised to find that quite a brisk traffic was carried on by the peasantry in small lots of land varying from a rood to a few acres. A reference to the records of Market Harborough, edited by Mr. Stocks, will show this, and the evidence is even stronger as to other places.

Among those who were not officials of the village, one of the most important personages was the miller. He rented the mill from the lord of the manor. All the peasantry in the manor were bound to bring their corn to be ground at his mill, and he was entitled to keep a proportion of the wheat fixed by custom as his toll. Justly or unjustly, the miller had a bad reputation for honesty. His customers said he stole part of the wheat and was never contented with his lawful toll. The proverb ran—

> "The honest miller has a thumb of gold."

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Another proverb is—

"Take a webster that is leal,
Take a miller that will not steal,
Take a priest that will not lie,
Lay these three a dead corpse by,
And the corpse revived will be
By the virtue of these three."

Life in a village such as this, where everyone worked at the same occupation at the same time, and had the same interests, was very different from the modern village where every man goes his own way—one man does one work and one another. Then all the villagers worked together at the plough or reaping, and on Sundays and the saints' days made holiday together. There was a community of feeling among them unknown nowadays. One of the most striking things in the old ballads is the public merrymakings.

Another feature in the older literature is the shepherd. One never finds a modern shepherd sitting by a babbling brook, playing a pan pipe or weaving willow garlands. In the days of wide open commons the shepherd drove his flock afield, and all his work was to see that the sheep did not stray. The shepherd belonged to a leisured class, and, like other idle men, his way of amusing himself varied. According to the poets, he spent most of his time playing the flute and talking to Phyllis. According to the records of sundry local courts, he spent a good deal of his time quarrelling with neighbouring shepherds and breaking their heads with his shepherd's crook. He was occasionally fined for it in the village court.

Sometimes the quiet of village life was broken by a frightened man, dusty and hot, crossing their fields. He was a felon who had committed a murder in the neighbourhood. Then followed the blowing of horns, for the hue and cry was out, and our villagers must carry the pursuit to the boundaries of the next village. If they failed to follow the hue and cry, the village will be fined at the next coming of the King's justices. Sometimes a more serious rebellion broke out, and then every man must arm and attend the sheriff's muster. Every man was bound to keep arms in his house suited to his degree, and upon summons he was bound to take his place in the county militia.

Periodically the lord of the manor held his court, when in theory every tenant was bound to attend, but in practice the duty was not insisted on. When one considers that there were no justices of the peace, and the King's judges might not visit the county for years, it will easily be seen that the maintenance of justices rested on the lord's court. It could hear all personal actions up to the value of forty shillings, and it could decide actions as to the title to land in the manor, and was held every three weeks. In some courts the lord's steward was the sole judge, but whenever a free man was concerned a trial affecting his life or estate was by jury, for Magna Charta had laid down—"No free man

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shall be taken or imprisoned, or dissoisee, or outlawed, or banished, except by the lawful judgment of his peers or by the law of the land."

One of the most important functions of the lord's court was View of Frankpledge. It was the duty of the court to see that every man was in a tithing. Until the middle of the thirteenth century the tithing or frankpledge system was in active operation. Not until Edward I. began his great reforms and placed the legal system of the country on its modern footing, did the frankpledge die away. The central idea of the tithing was the collective responsibility of each neighbourhood. The idea of individual criminal responsibility is quite modern. The old idea was of a collective responsibility, the criminal, his relatives, and neighbours were alike responsible. The same idea of collective responsibility prevailed in civil matters. An example occurred at the Fair of St. Ives in 1275. To that fair four merchants went from Leicester to sell hides and wool. Their names were Alan Baker, Adam with the Nose, Robert Howell, and William of Mountsorrel. But at the same fair was William of Fleetbridge, and Amice his wife, who had a claim for £2 15s. 2½d. against William Coventry, of Leicester, who did not go to the fair. On the ground that William Coventry was a member of the commonalty of Leicester, the court of the fair ordered our four merchants, who were also members of the commonalty of Leicester, to pay their fellow townsman's debt.

The frankpledge system was a union of men living near together for purposes of police. Each man in the tithing or frankpledge took the oath of allegiance to the King, and all the members were collectively responsible for the production in court of any member who was accused of a crime. In criminal records of the earlier part of the thirteenth century one frequently seen such entries as this: "The jurors say that "Henry Podrick's son slew Lithulf of Bushley, as they came from an ale "at Tewkesbury, and fled. He was in the frankpledge of the township of "Bushley, so the township is in mercy (*i.e.*, is fined). Englishry was not "presented, so it is a murder." (Selden Soc., vol. i., fol. 131.)

A theory frequently held is that the tithing consisted of ten men. This may have been so, but in the Midlands there is no trace of it in historic times. All the male inhabitants of the village over twelve years of age were usually in the same tithing. It seems very doubtful whether the frankpledge system prevailed at all north of the Humber.

Another very important function of the lord's court was the Assize of Bread and Beer. Every baker and every brewer was bound to conform to an assize or regulation as to price and quality; if he failed he was fined. The brewers were the worst offenders, for at almost every court a whole batch of brewsters or ale wives (the brewers were generally women) were brought up and fined. In some villages official ale tasters were appointed, whose duty was to taste every brew of beer and pronounce whether "it was good and wholesome for man's body." If not, or if the offender sold it at an excessive price, he was fined. Unfortunately in some places the ale tasters took advantage of their

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official position, and a bye-law was made at one court that the ale taster was entitled to one mug of beer free from every brewing, but if he wanted more he should pay for it.

The assize of bread and beer looks like an attempt to alter the working of the laws of supply and demand, but the real reason, I believe, was the facility with which the market price could be affected in those days. Corners were then looked on frankly as an evil to be suppressed by law. Now the purchase of sufficient wheat to raise the market price is impossible. Then the purchase of a few hundred quarters of wheat in a district could drive prices to a great height.

In the absence of navigable rivers the ordinary way of carrying merchandise was on pack horses, and this of course was totally unsuited for corn. There were absolutely no roads, nothing but unpaved tracks across the country, and but the roughest of carts for farm work and carrying.

Every village or little group of villages was absolutely self-dependent for the necessaries of life. They fattened their own beast, grew the corn for the year's supply of bread; the housewives spun the wool from the village sheep and wove the cloth for clothing.

Under these circumstances it was easy to force up the prices of necessaries, and the prevalence of the practice is shown by the frequency of legislation against forestallers and regraters, *i.e.*, those who bought up produce before it came to market, or bought an excessive quantity.

If the lord of the manor was a very great lord indeed he sometimes had a grant from the King of infangthef and outfangthef. Infangthef was the right of the lord to hang on his own gallows any men who were convicted of theft in his court, and outfangthef was the right of the lord to hang any of his own men who were convicted of theft outside his own jurisdiction. Curiously enough these privileges were highly valued. On one occasion an abbot of Tewkesbury took an infinity of trouble to hang one John Milksop on his own seignorial gallows. One reason for the value attached to the privilege was that the lord got the chattels of the convict instead of the King. Another reason was that if the lord had return of writs as well, he kept the sheriff out of his territories.

The idea of jurisdiction being attached to property is strange to us, but in the thirteenth century it seemed the most natural and convenient thing in the world. An Englishman of the nineteenth century at once concludes that these seignorial courts were engines of oppression, but there is no evidence, so far as I am aware, of this. The lord did not sit himself as judge, he appointed a lawyer, and the suitors to the court—or in other words the tenants—played the part of a jury. In the early part of the thirteenth century a prisoner had the option of being tried in three ways—by ordeal, by his country (*i.e.*, a jury), and by wager of battle. A relic of this system survived till last century, when a prisoner, after pleading not guilty, was asked—"Prisoner, how wilt thou be tried?" to which he replied, "By God and my country." The ordeal

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was abolished by the Lateran Council in 1215, and even before then the courts discouraged it if there was much suspicion against the prisoner. Prisoners had a way of succeeding at the ordeal.

Sometimes a thief turned informer, he confessed his theft and accused his comrades. Our forefathers had an ingenious way of dealing with such men which, while fully meeting the popular prejudice against an informer, yet turned him to good account. He was compelled to appeal (*i.e.*, to challenge to wager of battle) a certain number, say six, of his former associates. In that case he was obliged to fight them, one after another. If he came out victorious in every combat he was pardoned, and the vanquished, or such of them as survived the fight, were hung. If the informer was beaten in any fight he was hung. For convicted thieves, murderers, and all other felons there was only one punishment—death ; for minor offences varying fines.

You may perhaps think an undue proportion has been taken up by criminal matters, but in those days the criminal law came home to every one ; now it only affects the criminal classes. Then every free man was bound by law to keep arms in his house and practice their use. What, then, can be expected but frequent murders and quarrels ? The numerous forests and wastes gave a refuge to wandering robbers, possibly chivalrous outlaws like Robin Hood, but more probably of the type mentioned in the following extract from the records of the Worcestershire Eyre (*i.e.*, Assizes) of 1221.

"Howel the Markman, a wandering robber, and his fellows assaulted "a carter and would have robbed him, but the carter slew Howel and "defended himself against the others and escaped. And whereas it is "testified that Howel was a robber, let the carter go quit thereof. And "note that he is in the parts of Jerusalem, but let him come back safely "quit of that death."

This Howel was a bandit, living on the marshes of England and Wales—as unlike the traditional outlaw as possible. He tried to rob a carter ; the carter, who was a good fighting man, killed him in self-defence, and, to avoid the uncertainties of the law, left the country, possibly in the train of some knight bound for the Holy Land.

The villagers in such a village as I have described were not bound to attend the hundred court or the county court held by the sheriff. The only court besides the lord's court affecting them was that held by the King's justices when they made an eyre through the kingdom. Then every township was represented by the reeve and four men, to testify what had taken place since the last eyre, and, if necessary, with the men from the adjoining townships, to form a sort of grand jury for cases arising in their district.

It is fitting perhaps that I should close my remarks with a sketch of the personal status of a villein. The majority of the cultivators of the soil in the thirteenth century were villeins. They were personally free. If the lord killed or maimed his villein the King's justices would enquire into the matter and hang the lord if necessary. The lord's rights

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affected only the property of the villein and his work. Theoretically, the goods and chattels of a villein were in law the property of the lord, but in practice they were always treated as the tenant's.

The actual disabilities of a tenant were—(*a*) He could not leave his village, nor could his sons, without the lord's consent. If, however, they could get away and live a year and a day in a borough, the lord could not reclaim them. (*b*) The son of a villein could not enter holy orders without the lord's license. (*c*) When a villein died his best beast or other chattel was taken by his lord as a heriot. (*d*) When a villein's daughter is married, her father paid the lord a fine called "merchet." (*e*) He was bound to render the customary services due to the lord for his holding so many days' work at ploughing, so many days at reaping and mowing, and so on.

In addition there was generally some payment in money or kind. In some districts the lords commuted the rents previously paid in work for a fixed money payment—to the great advantage of the tenants when in the next century the Black Death drove the price of labour to an excessive height.

On the other hand the tenant in villeinage was secure of his holding. So long as he kept up his customary services the lord could not evict him.

The rents and other services were fixed by immemorial custom and could not be varied by either party without the consent of the other. Until the sixteenth century competition rents were unknown. If by any chance a villein's holding reverted to the lord, it was let out again at the customary rent and services—no new bargain was made to increase the rent.

It must be remembered that the whole organization of the country was regulated by custom. The common law of the land administered in the courts professed to be the general custom of the realm, no written basis of the law was appealed to, the judges professed to decide what had been the universal custom. If a new question arose it was frequently decided by the Roman law, but this was not avowedly recognised as a source of authority.

In the thirteenth century the whole organization of the country was socialistic. Every man's place in the social system was settled for him by custom administered as law; he was regulated at every turn. The great basis of society was the land. Every class had its rights and duties—the villein was bound to cultivate the land and pay his rent, the lord of the manor was bound to administer justice in his court and protect his villeins against oppression by outsiders. To his superior he owed military service and certain money payments, and if he did not hold directly of the Crown his over lord owed similar services to the Crown.

To finish this imperfect sketch of a village in the thirteenth century, we may compare the condition of the mass of the population with their condition in later times. Professor Thorold Rogers is of opinion that at

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no time were the working classes so well off materially as at the period under our notice, and every fact I have seen confirms this view.

There was practically no landless class. Every man of the poorest classes had a holding, large or small (excluding the population of the towns which were then of small importance). The rent he paid for his holding was absolutely fixed by custom and left him an abundant margin out of the cultivation of the fields to maintain himself and his family. The fare was coarse but abundant—wheaten bread, salt meat and beer. His clothing was home-made. The nature of his pursuits when the means for feeding beasts in the winter were limited, gave him abundant intervals of leisure to amuse himself. His sports do not all commend themselves to modern taste, but they amused him. Cock-fighting, bull-running, shooting with the long bow, quarter staff, and football occupied his spare time and earned for his country the name of merrie England.

APPENDIX.

In the publications of the Selden Society for the year 1890 is contained a transcript and translation of a MS. of about the thirteenth century, containing precedents for the use of stewards of local courts. The extract from it, printed below, will give a clearer idea of the method of proceeding than any general statement.

It will be observed that the proceedings begin with an interrogation of the prisoner by the judge, which reminds one of the practice of French rather than English courts. The prisoner, in consequence of the interrogation, pleads guilty, and there is consequently no trial by jury, although the judge invites him to "put thyself upon the good folk of this vill." Probably the villagers were too glad to catch a horse stealer to give him much chance with a jury.

The persons taking part in the dialogue are the steward who sat as judge of the court, the bailiff of the court who had charge of the accused, and the prisoner.

The original is in Norman-French, the language of the educated classes and the law courts in the thirteenth century.

Baillif.	Bailiff.
Sire.	Sir.
Fetes nos venir les prisons.	Let the prisoners come before us.
Sire volunters. Veez les ci.	That will I, sir. Lo! they are here.
Baillif.	Bailiff.
Sire.	Sir.
Pur quoi est cest homme pris?	For what cause was this man taken?
Sire pur une jumente quil prist en le champ de C. en autre manere que fere ne deust.	Sir, for a mere, which he took in the field of C. in other manner than he ought.
Coment avez non vos daunmestre?	What is thy name?
Sire, jeo ai a non W.	Sir, my name is W[illiam].

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Willame vos estes pris e atache en cest cort pur une jumente que ci est en present que vos deussez aver larcenusement pris en le champ de C. Coment vos volez aquiter de ceste larcine e de totes autres

Sire, si nul homme veut seure vers moi de larcine, ou de nul autre chose que soit encontre le pes le Roi e sa Coroune jeo sui prest a defendre moi par mon cors que jeo sui bons e lians.

W. ore me responez coment e par quele cointise avenistes vos a cele jumente, au meins vos ne poez desdire que ele ne fu troeve od vos e pur la vostre la vouastes

Sire jeo dessavou cele jumente que onques ne la vi avant ore.

W., donc voz poez mult hardiement mettre en les bones genz de ceste vile, que vos ne le emblastes pas.

Sire, nanail, ils sunt les uns que ount le quer gros envers moi e mult me hoent par acheison de cest fame que mest mis sure.

W., quidez vos que li ait nul que veut comander son cors e sa alme aui diables pur vos hov pur vostre amor ov pur vostre haunge? Certes nanail, il sunt bone gent e leaus e vos hostez de ceste bone gent tuz ceus que vos avez en suspecion de vos mettre a dampnaciun. Mes fetes bien e eiez deu avant vos oeuz e reconussez la verite de ceste chose e des autres que fetes avez, e ne vos donez mie tut a lentissement du diable mes reconussez la verite e vos nos troverez le plus merciables.

Sire pur deu eiez piete de moi, e jo vos reconustrai la verite e me mettrai tut en vostre liaute.

Willame par ma liaute vos ne averez si dreiture non Ore dites ceo que vos volez e rien ne nos celez.

Sire, ma grant poverte, a ma grant meseise e lentissement du diable me fist ceste jumente larcenusement prendre e sovent me out autre chose fet fere que fere ne deveray.

Deu le vos pardoint, fet le senescal. W., au meins avez reconu en ceste cort

William, thou art taken and attached in this court for a mare, which is here present, which thou art said to have taken larcenously in the field of C. How wilt thou acquit thyself of this larceny and all others?

Sir, if any man will sue against me for larceny, or any other thing that is against the peace of the King and his Crown, I am ready to defend myself by my body that I am good and lawful.*

W[illiam], now answer me by what device thou camest by this mare, for at least thou canst not deny that she was found with thee, and that thou didst avow her for thine own?

Sir, I disavow this mare, and never saw I her until now.

Then, W[illiam], thou canst right boldly put thyself upon the good folk of this vill, that never thou didst steal her.†

Nay, sir, for these men have their hearts big against me and hate me much because of this ill report which is surmised against me.

Thinkest thou, W[illiam], that there be any who would commend his body and soul to the devils for thee or for love or for hatred of thee? Nay, verily they are good folk and lawful, and thou canst oust from among them all those whom thou suspected of desiring thy condemnation.‡ But do thou what is right and have God before thine eyes, and confess the truth of this thing and the other things that thou hast done, and give not thyself wholly to the enticement of the devil, but confess the truth and thou shalt find us the more merciful.

Sir, in God's name have pity of me and I will confess to thee the truth, and I will put me wholly upon thy loyalty.

William, by my loyalty thou shalt have naught but justice! Say, therefore, what thou wilt, and conceal naught.

Sir, my great poverty and my great neediness and the enticement of the devil made me take this mare larcenously, and often have they made me do other things that I ought not to have done.

God pardon thee, saith the steward. W[illiam], at least thou hast confessed in

* This is an offer by the accused to fight a judicial combat with the owner of the mare if he will appeal him of the theft.

† A suggestion by the steward that the accused should be tried by a jury; the prisoner could not be so tried without his consent.

‡ The accused was entitled to a right of challenge—*i.e.*, he could object to any juror serving whom he suspected of personal enmity.

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que vos larcenusement pristes ceste jumente e ke plusurs autres maus avez fet ; nomez nos aucuns de vos compaingnons car il ne puet estre que vos navez eu compaingnie en vos mauveises oeveres.

Verroiement, sire, jeo noi onques compaingnie en mes mauveises fez fors soulement le malfe.

W., volez autre chose dire ov autre chose conustre.

Sire, nanail.

Baillif.

Sire.

Fet le retrere si fetes lui aver le prestre.

this court that larcenously thou tookest this mare, and hast thou done many other ill deeds ; now name some of thy fellows, for it cannot be but that thou hadst fellowship in thy evil deeds.

Of a truth, sir, never had I companion in my evil deeds save only the fiend.

W[illiam], wilt thou say or confess aught else ?

Nay, sir.

Bailiff.

Sir.

Take him away and let him have a priest. §

§ To confess and absolve the prisoner before he was hung. The phrase was a common euphemism for sentence of death.

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THE ABBEY PARK.

By Miss HOTTINGER. (Read before Section "D.")

IT is with great pleasure that I have watched the development of our beautiful and most varied Park, so much appreciated by all classes of people. From year to year the improvement has been noticeable: fine bushes and trees are hiding every year greater parts of factories and bricks; and from many spots the eye can rest for a while on nothing but greenery and bright flowers, or greenery and water, and happy birds disporting themselves on it.

If once the time comes when many more plants bear their names, the Park will be not only a place of recreation and joy to the eye and mind, but it will suggest to many untutored minds the thought that such a park is an open book, from which extensive and varied knowledge can be gathered. Names are nothing without the knowledge of the object they designate; but objects without names lie in the mind in a state of indifferent chaos, and are doomed to be forgotten very soon, or to be jumbled together in bewildering masses.

Phlox and Lychnis are thought to be just alike by unobservant persons; Campanula carpatica has been described as very much like Viola cornuta, because they happen to be planted in the same kind of borders, have the same colour, and reach the same height; Maples and Planes are continually confused; and so on. On the other hand, it is most difficult to make people remember that all Spiræas are Spiræas. There is indeed a marvellous variety in the leaves of *Spiræa ulmaria*, *salicifolia*, *palmata*, *fraxinifolia*, and *astilboides*, but if they will take the trouble to look closely at the single flowers, they must see the great resemblance. It seems almost incredible to many that *Aralia spinosa*—the fast growing, very hardy Angelica Tree from Virginia, with doubly pinnate, coarse leaves, and numerous suckers growing in groups round the mother stem, with soft, delicate leaves, when the leaves of the parent stem have lost all their beauty—can be a relation of the glossy palmate-leaved varieties of the compact growing *Aralia ricinifolia* of our greenhouses, or of *Aralia sieboldii*, *platanifolia*, *quinquefolia*, *peltata*, *trifoliata*, *integrifolia*, which, by the by, are often taken for *Ricinus communis* (Castor Oil Plant), because the leaves happen to be palmate and lobed.

If names were attached to plants, the observer and the under-gardeners would, in many cases, be induced to look for the points of resemblance between plants of the same name, and for the difference between those bearing different names.

My favourite entrance to the Park is from Church Gate. Very soon all sight of bricks and smoke is lost, and the eye rests on brilliant Golden Elders (*Sambucus nigra aurea*), contrasting beautifully with the

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rich copper of the leaves of an ornamental Plum Tree *(Prunus pissardii)*, with shining Laurels, and a broad band of that charming, soft-coloured lilac Calaminth *(Nepeta violacea)*, which has been flowering from June to October. In September, although the flowers of the Calaminth seemed to be over, the soft greyish leaves and the long grey calyces of the numerous whorled flowers still formed a delicate border. Before the end of the month fresh flowers had opened, and in October the view of the two broad bands of *Nepeta*, on both sides of the green turf, was a great treat to the eye, and the contrasts between gold, emerald, copper, and purple amethyst were extremely pretty.

In other parts of the Park the silvery leaves of many plants stand out in pretty relief among the gay colours and the greenery—for instance, *Tilia argentea*, a late flowering Lime with drooping branches; *Populus alba*, the White Poplar, so conspicuous in autumn; various Hollies, such as *Ilex albo marginata*, and *ferox argentea;* and several Firs: *Pinus strobus alba, Abies alba and pectinata, Cupressus alba spica, Cupressus alba variegata.* Among the herbaceous plants with silvery leaves are to be seen: *Salvia argentea*, a white flowering Sage; *Cerastium tomentosum*, the Dusty Miller; *Stachys lanata, Arabis albida, Bocconia cordata, Leucophyta, Santolina cyparissus*, Italian or Cotton Lavender, and *Echinops sphærocephalus*, a Globe Thistle, with large pinnatifid leaves, clothed with a white cottony down beneath, and with numerous blue flowerheads.

There are golden varieties of several trees, such as Elm, Alder, Oak, Yew, Ribes, Juniper, Holly; the rich copper tints of a Beech, a Barberry, and a Plum Tree, and a few fine scarlet leaves which are to be seen almost all the year round among the dark green large pinnate leathery leaves of *Mahonia japonica;* the cut-leaved Oaks, Elders, Ashes, Limes, Beeches, Spanish Chestnuts, all these add beautifully to the variety of tints and forms that strike the eye everywhere.

Among the interesting foreign trees, an American Maple *(Acer rubrum)* is brilliantly red in autumn; the Sugar Maple *(Acer saccharinum)* and the Sweet Gum *(Liquidambar styraciflua)* are specially worthy of notice. Fortunately they are close together, else it would be difficult to remember which is which, as they are not likely to yield either sugar or gum in our Park. In their present stage they are similar in growth and height, both have five-lobed palmate leaves of the same size, similar tints of summer green and of autumn red, and long petioles; but the leaves of the Sweet Gum are alternate, and the lobes are sharply serrate, while the leaves of the Sugar Maple are distinctly opposite and have entire lobes.

Liquidambar styraciflua or Sweet Gum belongs to the Amentaceæ, sub-family Altingeaceæ. It is a native of Virginia; a small erect-growing tree of elegant appearance, especially towards autumn. The leaves are borne on long and slender petioles, glabrous, deciduous; the recess of the veins at the base of the leaves is villous. The Indians chew the gum, which exudes in the spring, as a preservative to their teeth. The Sweet Gum Tree is sometimes found of an immense size,

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especially in the Southern States of America. Its wood is beautifully variegated, of an exquisite hard texture and fine grain. Furniture made from it has a handsome appearance.

But let us return to our own Park and look at the *Catalpa bignonioides*, syn., *Catalpa syringæfolia*, the Indian Bean Tree, which, I hope, may some day bear beautiful panicles of white and purple flowers. There is not much chance of our ever seeing the seed-vessel attaining the length of a foot as it does in the Southern States of North America.

Colutea arborescens or Bladder Senna bears its yellow papilionaceous flowers, tipped with red in the bud, from early summer till late in the autumn, and all through September and October flowers are to be seen, together with the inflated membranaceous pods and the fresh green of the small leaflets of the pinnate leaves. The Bladder Senna is a valuable shrub for town plantings—the delight of children when they can squeeze the pods in their own gardens and hear the report when they burst.

Rosa rugosa; varieties, *alba*, *rosea*, *rubra*, with bright green wrinkled leaves, large single flowers, and fine hips crowned by large calyx segments.

Rubus japonica rosea, a flowering Raspberry, with pink flowers as large as dog roses, and large five-lobed palmate leaves

Lonicera heckrotii, a splendid quick-growing shrub for parks and towns, a Californian species of Honeysuckle, with small yellow flowers on large red bracts, which last longer and are more conspicuous than the flowers.

Cornus sanguinea, Dog Wood or Wild Cornel, with its bright red twigs, corymbs of white flowers, and small purple berries.

Cornus alba, White-berried Dog Wood, with deep red bark, oblong acuminate leaves, white flowers, followed by white berries; a native of Siberia.

Cornus mascula variegata, the Cornel Cherry, with variegated leaves, for the numerous small yellow flowers of which we must watch early in March, long before the leaves appear.

Weigela amabilis, *alba* and *rosea*, sometimes called Chinese Honeysuckle, one of the Caprifoliaceæ, of which there are some very handsome varieties, probably of hybrid origin—white and rose, purplish red, striped red and white, &c.

A great variety of Willows thrive splendidly in the spots chosen for them, most appropriately, on the banks of the ponds, on the little island, &c.

Many *Aucubas*, green and variegated, flower freely, and mostly bear their bright red berries all through the winter.

Among the creepers covering the gardeners' cottages we can see nearly all the year through some of the pink and white flowers of *Escallonia rubra* among the evergreen shining leaves. It is a native of Chili, of the Saxifrage Tribe, first brought to Europe by the Spanish traveller Escallon.

Cratægus pyracantha, Fire Thorn, is always pleasing, now with its rich corymbs of white rosaceous flowers, then again with its brilliant

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orange-scarlet little apples, and at all times with its bright sharply-serrate leaves.

The various species of *Cotoneasters*, creepers and standards, also adorn the walls and shrubberies in summer and winter.

Forsythia suspensa expands its large yellow jessamine-like blossoms early in spring, before the leaves, which till late in October remain of a rich green.

As to Rhododendrons, Azaleas, Heaths (among the latter St. Dabeoc's Heath, *Menziesia polifolia*, with large purple bells and linear leaves, which are silvery beneath); *Gaultheria*, *Pernettya*, *Kalmia angustifolia*, *Daphne cneorum* (which was full of flowers in June and again in October) —it would require a special Paper to do them justice.

The great variety of *Abies*, *Pinus*, *Picea*, *Biota*, *Thuja*, *Thujopsis*, *Cupressus*, *Retinospora*, quite defy my description.

Cryptomeria elegans is indeed an elegant little shrub; *Taxus adpressa*, *aurea variegata*, and *elegantissima* are not quite so difficult to distinguish as the other Conifers.

But we must hasten on to the herbaceous plants. One of the most striking this year has been: *Silphium laciniatum*, a true prairie plant, which has reached a height of eight feet, and bore, at the beginning of October, twenty-five large yellow compound flowers and at least ten more buds. It is also called Compass Plant, Pilot Weed, Polar Plant, Rosin Weed, and Turpentine Weed; the former names refer to the fancy that, on the wide open prairies, the large deeply-pinnatifid leaves present their surfaces uniformly to north and south. They do not in our Park, nor do they exude resin as in their native country.

The chief features of the genus *Silphium* are the yellow monœcious radiate heads, the ray-florets strap-shaped and pistil-bearing, the disc-florets tubular and sterile, the broad, flat, perfect achenes, surrounded by a wing which is notched at the summit and usually terminates in two short awn-like teeth representing the pappus.

Other striking Compositæ are *Rudbeckia maxima*, reaching a height of six feet, with a glaucous stem, glaucous stem-clasping leaves, and large yellow flowerheads, with very long ray flowers and a conical darker centre.

Rudbeckia newmani, *Inula hirta* and *glandulosa* are also handsome plants, flowering in July.

Buphthalmum salicifolium is a grand perennial, a native of South Germany, where it flowers abundantly in the middle of summer in lime stone districts on woody and rocky ground.

Helenium pumilum, of a rich yellow, flowers through September and October.

Harpalium rigidum, a hardy North American plant, displays its abundant large yellow flowers through many months

The Globe Thistles: *Echinops Ruthenicus*, a native of Germany, has numerous capitules of blue flowers all through the summer. *Echinops sphærocephalus* is a taller plant, attaining a height of five or six feet, and occurs wild in the South of Europe.

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Erigeron speciosum superbum, a native of California, displays its numerous narrow ray-florets of a lilac blue in pretty contrast to the yellow disc.

Olearia hastii, with its coriaceous small leaves of a brilliant green above and silvery beneath, is interesting as one of the rare shrubs that bear composite flowers. These white flowers appear in August and September and are not unlike Yarrow, only a small number of florets being in one involucre.

Diplopappus chrysantha is a shrubby perennial about three feet high, with golden twigs and white composite flowers, very near Aster, and only differing from it in the nature of the pappus, which is double, the outer row of short stiff bristles, the inner of capillary bristles as long as the disc-florets, whilst in Aster the pappus is single.

The pretty *Santolina cyparissus*, Italian or Cotton Lavender, a dwarf densely-branched shrub, clothed with close hairy pubescence. The alternate, linear little leaves, very close together, look like rows of short obtuse teeth projecting in all directions. The flowerheads are small, yellow, and placed on peduncles from six to eight inches in length. It was originally called *Santa lina* (holy flax), in allusion to its reputed medicinal properties.

Eupatorium fraserii is a fine white and late flowering Composite from Carolina.

Gnaphalium leontopodium or *Leontopodium alpinum*, the Swiss and Tyrolese *Edelweiss*, or Lion's Paw, or Rayed Felt-wort, has flowered and seeded uncommonly well in this non-Alpine region.

Among other interesting plants, we must not forget the lilac American Labiate: *Physostegia virginiana* or *Dracocephalum virginianum*, a vigorous herbaceous plant attaining a height of nearly five feet, flowering very freely in long dense spikes. It is called *Physostegia* (*physa*, bladder; *stegos*, covering) because of the inflated calyx and inflated bilabiate corolla; and *Dracocephalum* because of its resemblance to a dragon's head. Twenty to thirty flowers are situated in long spikes, the lower ones opening in August and a few yet visible at the end of October. There is a personate flower of the same shade of lilac: *Chelone obliqua*, not so tall, but with considerably larger carollas, the broad keeled upper lip and scarcely open mouth giving it some resemblance to the head of a tortoise or turtle, to which feature are due both its scientific appellation and the popular American name, Turtle-head.

The mass of *Lythrum salicaria* or Purple Loose-strife would have afforded many specimens for examining the varying position and length of stamens and pistils; no doubt trimorphic flowers could have been discovered.

Among the great variety of Saxifrages, a yellow flowering species with trailing stems, *Saxifraga cymbalaria* is worth mentioning.

Lobelia fulgens and *cardinalis* are very showy scarlet perennials.

Polemonium himalaicum is a fine variety of Greek Valerian or Jacob's Ladder.

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Sedum spectabilis has fine corymbs of rose-coloured flowers and is a splendid plant for autumn, which does well on lawns underneath trees.

Claytonia sibirica, of the order Portulacaceæ, is an interesting though not showy plant, with its pretty purple flowers and quaint leaves.

Among the hardy plants not often met with, the following must be mentioned :—

Morina longifolium, one of the Dipsaceæ, with large lobed spinescent radical leaves and showy rose, carmine, and white flowers.

Lilium speciosum kraetzerii, a fine hardy lily.

Thalictrum adiantoides, with finely-divided root-leaves resembling Maidenhair.

Potentilla tridentata, with white flowers and silvery leaves, each with three prominent teeth at the apex.

Genista triquetra, a Dwarf Corsican Broom with abundant yellow flowers and three-winged procumbent stalks.

Dryas octopetala, a lovely Alpine rosaceous plant with white flowers. The leaves, which are white beneath and coarsely cremate-serrate, bear some resemblance to an oak leaf, hence the name *Dryas* (Greek *drus* an oak tree).

Acantholimon glumaceum, a pretty Alpine plant of easy culture ; a native of Armenia.

Helianthemum venustum, a beautiful late flowering Rock Rose from the South of Europe.

Lithospermum prostratum, with its deep blue flowers and stone-like little seeds.

Cheiranthus alpinus.

Œnothera taraxacifolia, with its long-tubed pink and white flowers blooming till very late.

As to *Antirrhinums*, *Linarias*, and *Pentstemons*, the marvellous varieties in which they were to be seen for many months were a charming feature of the Park,—mostly hybrid seedlings.

Delphinium, *Aquilegia* and *Papaver* also occurred in great and beautiful varieties.

There was an abundance of *Godetias*, *Clarkias*, and *Œnotheras.*

Schizanthus pinnatus, one of the Scrophularinæ, of straggling growth, but making a fine show when sown in masses, as it was this year, displayed an endless variety of shades of purple, lilac, red, brown, pink, white, in pretty combinations. The mass of these flowers was a lovely sight in August, and a few were still blooming at the beginning of October.

The sweet *Campanula carpatica* formed a broad border on the slope, near the pavilion, as in former years.

Calendula, *Tagetes*, *Coreopsis*, *Pyrethrum*, *Chrysanthemums*, of all kinds ; the showy *Bartonia aurea* or *Mentzelia aurea ;* the pretty *Thrift ;* the superb *Gladioli ;* the various *Malvaceæ ; Centaurea cyanus* in abundance ; *Centaurea montana* in white, blue, and lilac varieties ; *Sunflowers*, great and small, annual and perennial ; *Dahlias*, single and

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double; *Veronica rupestris*, which was in flower from spring till November; *Astrantia major*; *Phlox* of all colours and varieties, annual and perennial; *Geum*, *Potentilla*, *Scabiosa*, the pretty *Cruciandella stylosa*, the showy *Alstræmeria aurantiaca*, all these flowers fill up the vast beds and spaces between the shrubs in a beautiful and most varied manner.

Salvia argentea, a native of Crete, with large, white, al undant, woolly root leaves, is particularly useful for filling up spaces in large shrubberies. The leaves are most beautiful before the tall branching, rather coarse stalks rise, bearing large white flowers in numerous whorls.

One of the interesting plants, not often met with, flowered in June and was very striking with its numerous flowers resembling the common blue Hyacinth—*Camassia esculenta*, the Quamash of the North American Indians, a liliaceous plant. The numerous root leaves are about a foot long, very narrow, and grooved down the inside. The scapes grow from a foot to a foot and a half, and bear from twelve to twenty blue or white flowers. The segments of the perianth are slightly connected at the base and spread out horizontally, but not equally; the five upper ones are closer together and inclined upwards, while the lower sixth stands by itself and is bent downwards. Each segment has three prominent nerves on the outside and a stamen attached to its base on the inside. *Camassia* grows in great abundance in swampy plains on the north-west coast of America and Vancouver's Island. Its bulbs form the greater part of the vegetable food of the Indians, the different tribes visiting the plains for the purpose of collecting them immediately after the plant has flowered. The digging of Quamash is a time of feasting and rejoicing among the Indians; the entire labour, however, devolves upon the women, and the unmarried women endeavour to excel each other in the quantity of the roots they collect, their fame as future good wives depending upon their activity in the Quamash plains. The roots are cooked by digging a hole in the ground, paving it with large stones upon which a fire is lighted and kept up until they are red hot; then they are covered with alternate layers of branches and Quamash roots till the hole is full; it is then covered with earth, a fire is kept burning upon it for twenty-four hours, when the roots are taken out and dried, or pounded into cakes for future use.

Among the medicinal plants cultivated in the Park, the following deserve special mention:—

Glycirrhiza glabra, Liquorice.
Colchicum autumnale, Autumn Crocus.
Atropa belladonna, Deadly Nightshade.
Veratrum album, sometimes called White Hellebore.
Hyoscyamus niger, Henbane.
Datura metel, Downy Thorn Apple.
Gratiola officinalis, Hedge Hyssop.
Saponaria officinalis, Common Soapwort.
Althæa officinalis, Common Marsh Mallow.
Asarum europæum, Asarabacca.

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It is impossible, in the compass of this Paper, to do justice to the beautifully-arranged sub-tropical and succulent beds. Each year the arrangement has been an improvement on the preceding year. This summer the fine background of dark bushes set off the *Canna indica*, with its rich long leaves and its scarlet and yellow flowers, to great advantage. The splendid *Begonias* were set off by the *Canna* in the back and the green turf in the foreground.

The variety of *Montbretias* was perfectly charming: *Cocosmæflora*, *Pottsii*, *Drap d'or*, *Bouquet parfait*, *Solfatara*, *Eldorado*. *Anthericum variegatum*, syn., *Phalangium variegatum*, of the order Liliaceæ, displayed its delicate white flowers for many weeks, and its grass-like channelled leaves striped with white were very graceful.

Francoa appendiculata, with rather coarse lyrately pinnatifid root leaves, white flowers in long loose racemes, four sepals, four petals, eight fertile and eight sterile stamens; a native of Chili; perennial; belonging, according to the "Treasury," to *Francoaceæ*, according to Loudon to *Galacineæ*.

Of the Marvel of Peru *Mirabilis jalapa* there were twelve distinct varieties, the pretty white, yellow, red, pink, streaked or blotched with one or two colours, looked well on the abundant rich foliage. The names *Marvel of Peru* and *Mirabilis* were probably given to it because the medicinal Jalap, with its wonderful properties, was thought to be derived from it; the latter, however, is the root of *Exogonium purga*, and both are called Jalap from the Mexican province Xalapa, where they grow wild.

There were many plants of Snake's Beard or *Ophiopogon japonicus*, a pretty liliaceous plant from China and Japan, with linear ensiform leaves, striped with white, and racemes of blue globular flowers terminating the two-edged scape

Maize with variegated leaves flowered abundantly.

Eurya angustifolia, an evergreen shrub, a native of India, China, and adjacent islands, belonging to the order Ternstrœmeaceæ.

Solanum melongena or Egg Plant.

Solanum balbisi, with large leaves, the veins of which are beset with prickles.

Many fine plants of *Eucalyptus*.

Polianthes tuberosa or Tuberose.

Thunbergia. *Vitis heterophylla variegata*.

Erythrina crista-galli or Coral Tree.

Echeveria of various species: *Rochea*, *Pachyphytum*, *Cacti*, *Aloes*, &c.

There is such a great quantity and variety in our Park that one might think we ought to be satisfied; but there are a few trees and other plants which would add greatly to the interest of the Park, and which probably would not find it more difficult to thrive there than *Edelweiss*, *Liquidambar*, and *Lilium speciosum*. I would suggest the following, viz.:—

Ailanthus glandulosa.

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Liriodendron tulipifera, Tulip Tree.
Cercis siliquastrum, Judas Tree.
Rhus cotinus, Venetian Sumach.
Gleditschia triacanthos, Honey Locust.
Salisburia adiantifolia, Maidenhair Tree.
Garrya elliptica.
Sophora japonica.
Caragana arborescens.
Caragana pendula.
Moris nigra, Common Mulberry.
Morus alba, White Mulberry.
Buddlea globosa.
Aristolochia sipho, Dutchman's Pipe.
A few more *Euonymus europæus.*
Euonymus latifolius.
Menyanthes trifoliata, Buck-bean.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Only two meetings have been held since the last report. On January 12th, Mr. C. J. BILLSON read a paper on "Giants: a Study in Folklore," and on March 15th, Mr. FERGUS BURDETT read a paper on "The Decay of Rhetoric."

At the meeting on January 12th, after the paper, the Section decided to form a Committee for the collection of the Folk-lore, Local Traditions, Superstitions, &c., of the County.

J. M. GIMSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

December 16th, 1891.—Present, eight gentlemen, three ladies.

Exhibition of Cereals.—Mr. MOTT gave a short account of the various grains included under the term "Cereals." They were all the seeds of cultivated grasses, the principal ones being Wheat, Barley, Oats, Rye, Rice, Maize, Millet, and various species of Zizania, Sorghum and Panicum, known by such local names as, Swamp-rice, Canada Rice, Guinea Corn. There were three marked varieties of Wheat, the Summer, the Winter, and the Spelter; and two of Barley, the 2-rowed and 6-rowed.

Herbarium.—From the reports of the five Receivers it appeared that about 500 sheets of dried plants had been prepared during the year.

Study of the Order Insectivora.—Mr. MOTT described the position of the Order in the class MAMMALIA, by reference to the following Synopsis written out upon the large wall slates.

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CLASS MAMMALIA.

Sub-class 1. Prototheria.
Order 1. Monotremata.

Sub-class 2. Metatheria.
Order 1. Marsupialia.

Sub-class 3. Eutheria.

Order 1.	Edentata.	Homodont and Monophyodont.
,, 2.	Sirenia.	
,, 3.	Cetacea.	
,, 4.	Insectivora	Heterodont and Diphyodont.
,, 5.	Chiroptera	
,, 6.	Rodentia	
,, 7.	Ungulata	
,, 8.	Carnivora	
,, 9.	Quadrumana	
,, 10.	Bimana	

Homodont—Teeth of one form only.

Heterodont—Teeth of various forms; *incisor*, *canine*, *pre-molar* and *molar*.

Monophyodont—Teeth of one series only.

Diphyodont—Teeth of two series; *milk teeth* and *permanent teeth*.

The Insectivora are found all over the world, except in South America and Australia. They feed upon insects, grubs, worms, &c. They are all of small size, with small low-class brains having no convolutions, and with the cerebral hemispheres not overlapping the cerebellum. They are divided into ten families, of which three only are represented in Europe and in Britain, viz: the Hedgehogs, the Shrews, and the Moles. There are about twenty known species of Hedgehogs, forty of Shrews, and twenty of Moles.

This "Study" was followed by an interesting discussion.

January 20th, 1892.—Present, eight gentlemen, six ladies.

Exhibition of Leathers.—A large and very interesting collection of skins, tanned and prepared in various ways, and with various surfaces, was exhibited by Mr. G. C. TURNER; also some curious specimens by the CHAIRMAN, including the skin of the Rhinoceros.

Paper.—"On the connection between weather and the flowering of plants," by the Chairman (Rev. T. A. PRESTON), illustrated by a large number of elaborate diagrams. The subject is one of much interest but

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of great complexity. No laws have yet been formulated which seem to cover all the facts. The CHAIRMAN said he had been studying it carefully for many years, but the results were not very satisfactory. The amount of rainfall was an important factor, so also were the amount of sunshine, and of general temperature. It had been stated, but he doubted whether it were true, that no vegetable growth took place at a lower temperature than 42°.

February 17th, 1892.—With eight inches of snow on the ground, and the thermometer at 20° below freezing, the Meeting was a small one. Only eight were present. Miss GERTRUDE CLARKE was elected an Associate Member of the Section.

Exhibition of Mosses.—Mr. MOTT brought specimens of about a dozen species of Mosses, mostly in fruit, gathered a few days previously at Cropstone and Swithland Wood. The leaves and peristomes of several were examined under the microscope.

The Paper on "Stings and Poison-fangs" was postponed to a larger meeting and more genial weather, as all the members were anxious to get home.

It was agreed to ask the Council for a grant of £2 10s. for periodicals during 1892, viz: "Journal of Botany," "Kew Bulletin," "Zoologist," and "Science Gossip."

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

December 11th.—A Paper was read by the SECRETARY, on "Cell Formation."

Having shown that all living organisms, whether animal or vegetable, could be shown on analysis to be built up of few or many cells, he alluded to the steps which had led to the appreciation of this truth, contrasting the speculations of Grecian Philosophers two thousand years ago with the vast and increasing store of facts furnished by present day embryological researches.

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After defining as clearly as possible the term "cell," a typical tissue cell was described, and afterwards an account was given of the act of division amongst cells of this class, both by the "direct" method, and also by the more complicated process of "karyokinesis," in describing which the various nuclear changes were illustrated by diagrams.

A large part of the Paper was devoted to the consideration of cell formation amongst the Protozoa, which, it was pointed out, were, with few exceptions, strictly unicellular organisms. Referring to the views advanced by the eminent German biologist, Weissmann, who (on the ground that living matter possessed as a primordial attribute an unlimited power of growth and reproduction, quite independently of the actual mode of reproduction, sexual or asexual) would grant to the lowly Protozoon a virtual immortality, it was pointed out that recent researches proved—in the case of the Ciliated Infusoria at any rate,—that this theory would not hold good, since amongst these forms multiplication by simple division had been shown to result in degeneration and ultimate death, if carried on through successive generations. Passing on to consider the phenomena of conjugation, and consequent rejuvenescence of cells amongst the Protozoa, a description was given of the remarkable changes undergone by the nuclear apparatus in some Infusoria during its reconstruction in conjugation.

The process in *Colpoda cucullus* was described in some detail and illustrated by diagrams, which, in other portions of the Paper, were supplemented by blackboard sketches.

At the conclusion of the Paper, a vote of thanks, proposed by Dr. POPE, was carried unanimously.

January 18th, 1892.—Mr. F. W. BOAM, F.C.S., F.G.S., read a Paper entitled "Cornish Mines and Minerals."

In the course of his remarks, the Lecturer said:—It is difficult to determine the original position and order of the Cornish strata, owing to the intense volcanic action they have passed through. A generally accepted theory holds that granite forms the real basis of the peninsula, and that the extensive Devonian slates are deposited upon this granite foundation. In places the granite has been pushed up into the slate, and subsequent denudation has laid bare these protrusions. They extend, at intervals, throughout the length of Cornwall; the slate, or "killas," lying around these peaks. Other rock formations in Cornwall are—the Silurian, on the South coast around Chapel Point, and the Carboniferous, occupying the Northern corner of the county. Among the Igneous rocks of the district are extensive cliffs of Greenstone, or Serpentine, at various places upon the coast and inland; also Gabbro and Phonolite, or

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"clinkstone," found in the neighbourhood of the Lizard Head. (The localities of the various rock foundations were illustrated by a coloured lantern slide, as was also the effect of denudation in producing "rocking-stones.") The Devonian slates ("killas") forming nearly the whole of the upper strata of Cornwall, are normally of a bluish-grey colour, and lie in very well defined and regular layers. When approaching the granite, however, they are much broken and dislocated, and possess a reddish colour and altered character. In this formation most metalliferous lodes and veins occur. The modes of formation of such lodes is doubtful. They are probably the result of igneous action succeeded by aqueous action in the majority of cases. As a rule, all lodes increase in richness as they approach a junction of the "killas" with the granite or elvan. The same holds true when lodes approach each other, join, or intersect, the great exception being a vein of argentiferous clay, called locally the "flucken lode." On nearing this, the metalliferous lodes die out entirely, or else become very poor and scattered. Copper and tin lodes are often found intersecting. Copper lodes usually dip about 65 degrees to the North, and tin lodes about 70 degress to the South. (Illustrated by slide). Lodes often increase in value the deeper they descend, and probably extend as far as the underlying granite. In starting a new mine, the shaft is sunk upon a junction or intersection of lodes if possible (illustrated by slide). But the older plan was to follow the course of a lode which outcropped at the surface, thus producing very irregular shafts, although this seems to distress Cornish miners but little.

A stranger among Cornish miners is most forcibly struck by the great conservatism of the miners regarding their plant and methods of working. If lodes enough have not been cut through in sinking the shaft to a junction, "pitwork" (comprising pumping gear, ladders, &c.) is fixed and the shaft continued. Meanwhile "stopes" (working places) and "levels" (passages) are driven in the lode rock. The stopes are worked by "tributers," men who raise the ore and receive a percentage of the value of the dressed ore, and the "levels," "drifts," and "headings," for finding and "cross-cutting" other lodes, are worked by "tutwork" men, who are paid by the fathom. In all mines, with one or two exceptions, ladders are fixed in the shafts for the miners to descend by (illustrated by slide), but in one or two, "man engines" are used for conveying the men up and down (illustrated by slide). When the levels are extensive, it frequently becomes necessary to put a short shaft between a higher and a lower level; these shafts go by the name of "winzes" (illustrated by slide). The ore is broken from the lodes by blasting with dynamite cartridges, the blast holes being drilled by hand in most mines (illustrated by slide). The Botallack mine (illustrated by slide) is rather noted on account of its working extending for a considerable distance under the sea.

The Cornish mines vary from a few fathoms to three hundred fathoms in depth; the deepest mine being East Pool, which has a depth

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of four hundred fathoms or two thousand four hundred feet. "Mundic," tin, and copper, are the principal ores worked in Cornwall, "mundic," or arsenical iron pyrites' lodes varying from an inch or two, to forty feet wide. When the ore reaches the surface, it is picked over and broken by women, called "bal-girls." It then goes to the calciner to be roasted. During roasting, the sulphur and arsenic are oxidised by a stream of hot air, and the volatile "white arsenic" fumes, and sulphur dioxide gas formed, pass off into large brickwork "chambers." The "white arsenic" cools and is deposited, while the sulphur dioxide escapes into the air by a tall chimney stack. The dirty blackish "arsenic soot" is collected and resublimed in a refinery furnace, and the fine, white, crystalline powder again collected and ground, when the product is the "white arsenic" of commerce. Lump arsenic is made by subliming the powder in a closed iron cylinder. The "rinkle," or burnt ore, is mixed with salt and again roasted, and then tipped into large tanks with perforated bottoms. Brine is pumped over it, and drains through into some tanks below, into which scrap iron is also put. After standing a few days the liquor is run off, the mixture of metallic copper and silver collected, and sold to the South Wales smelters. The remaining wet ore, called "tin-whits," is removed and passed through powerful stamp batteries, crushed extremely fine, and washed into concentrating "buddles." On leaving these the concentrated "whits" contain about 70 per cent. of pure metallic tin. An ore containing only 1 or 1½ per cent. of tin, or twenty to thirty pounds to the ton of ore, can be treated at a profit.

Owing to the large amount of swindling which has characterised Cornish mining, it has obtained a bad name. It is quiet at the present time, but if the Cornishman would throw off his "conservatism" and adopt new and modern plant and methods, their industry would once again prosper and succeed.

The Paper was illustrated by numerous specimens of minerals and, for the first time at meetings of this nature, the oxy-hydrogen limelight was employed.

After an interesting discussion, a vote of thanks, proposed by the CHAIRMAN, was carried unanimously.

The CHAIRMAN gave a short notice, and exhibited some fossil vertebrate remains from the Rhætics of Aust Cliff, Gloucestershire.

He also exhibited a valuable series of examples of the very magnificent genus *Morpho*, from South America. These, which are large and brilliantly coloured butterflies, rank justly amongst the most gorgeous tropical insects, with their colouring of glittering metallic blue, ranging from a peacock blue in *M. menelaus* and *M. helenor*, to a lovely silvery tint in

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M. sulkowskyi. Another striking form also was *M. cypris*, which has the wings of the most brilliant metallic cobalt blue, variegated with white markings.

February 15th.—Owing to the inclemency of the weather and consequent small attendance of members, it was unanimously resolved to postpone the reading of Dr. POPE's Paper on "The Hind-limb of Vertebrates" to the March meeting.

MONTAGU BROWNE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. J. M. GIMSON, 100, New Walk.

Secretary—Mr. F. S. HERNE, 49, Mere Road.

The Section meets on the second Tuesday in each month.

April 12.—Rev. J. E. STOCKS, M.A.—"The Roll of Bishop Hugh of Wells, (1209-1235) for the Archdeaconry of Leicester."

J. M. GIMSON, *Chairman.*

SECTION "D."

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston Rectory, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Highfields, Leicester.

EXCURSIONS.—The second Wednesday in each Summer month, at about 3 p.m.

EVENING MEETINGS—The third Wednesday in each month, at the Museum, at 7 p.m.

1892.

April 13.—Excursion to Scraptoft.
20.—1. Exhibition of Fresh-water Shells.
2. Paper.—"Notes on Leicestershire Pond-weeds." (Potamogetons) by Mr. E. F. COOPER, F.L.S.
3. Microscope.

May 11.—Excursion to Bradgate.
May 18.—1. Exhibition of Plants and Flowers of the Order Ranunculaceæ.
2. Study of the Order. By. Mr. F. T. MOTT, F.R.G.S.
3. Microscope.

June 8.—Excursion to Kegworth.
June 15.—1. Exhibition of the less common Garden Flowers.
2. Paper on "Starches," by Mr. S. Burford, F.C.S.
3. Microscope.

T. A. PRESTON, *Chairman.*

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SECTION "E."

Chairman—MONTAGU BROWNE, F.Z.S., F.G.S., Town Museum.

Vice-Chairman—Dr. F. M. POPE, Prebend Street.

Secretary—Mr. F. R. ROWLEY, Town Museum.

EVENING MEETINGS.

1892.

April 11.—Paper by Mr. L. CREAGHE-HAWARD, "Notes on some East Anglian Birds."

May 9.—Further Notes by the CHAIRMAN on some Rhætic Fossils from Aust Cliff, and also on some Jurassic Fossils, lately presented to the Museum by Mr. S. R. Pattison.

June 13.—Paper (not yet arranged).

MONTAGU BROWNE, *Chairman.*

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TRANSACTIONS

OF THE

LEICESTER

LITERARY & PHILOSOPHICAL

SOCIETY.

NEW QUARTERLY SERIES.

VOL. II.

PART XII., JULY, 1892.

TOGETHER WITH THE

REPORT OF THE COUNCIL,

AND

ANNUAL REPORTS OF THE SECTIONS,

PRESENTED TO THE

ANNUAL GENERAL MEETING,

ASSEMBLED JUNE 27TH, 1892.

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GENERAL MEETINGS.

ANNUAL GENERAL MEETING.

At the FIFTY-SEVENTH ANNUAL MEETING of the Society, held in the Lecture Hall, Town Museum, on Monday, the 27th of June, 1892, at 7 p.m.,

R. HARVEY, Esq., LL.B., Retiring President, in the Chair,

the CORRESPONDING SECRETARY presented the Annual Report of the Council, which was taken as read.

The FINANCIAL SECRETARY then read the Financial Statement, as audited.

Moved by Mr. T. S. ELGOOD, seconded by Mr. T. CARTER :—

> "That the Annual Report and Financial Statement be adopted and printed for circulation."

The CHAIRMAN announced the election by the Council of the Rev. P. T. FORSYTH, M.A., as the new President.

He then nominated Mr. J. M. GIMSON and Mr. T. S. ELGOOD as Scrutineers, and the meeting proceeded to the election of officers, when the following were elected :—

Vice-Presidents:

R. HARVEY, LL.B.
G. STEVENSON.
F. T. MOTT, F.R.G.S.
C. J. BILLSON, M.A.

Treasurer:

ALFRED PAGET.

Council:

C. J. BOND, F.R.C.S.
T. C. LEE.
J. D. PAUL, F.G.S.
F. M. POPE, M.B.
C. W. COOPER, M.B.
M. L. LEWIS, M.A., LL.M.
REV. T. A. PRESTON, M.A.
T. CARTER, LL.B.
HERBERT ELLIS.
REV. J. WENT, M.A.
J. J. W. KNOWLES.
W. STANYON.

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Honorary Secretaries:

CORRESPONDING SECRETARY	J. M. GIMSON.
FINANCIAL SECRETARY	G. HULL.
MINUTE SECRETARY	W. SIMPSON.

Moved by Mr. J. D. PAUL, seconded by Mr. M. L. LEWIS:

"That the thanks of the Society be given to the Honorary Secretaries and other officers of the Society for their services during the past year; to the representatives and proprietors of the local press for their reports of the Society's proceedings; and to the Curator for his services to the Museum."

Carried.

Moved by Mr. C. J. BILLSON, seconded by Mr. W. SIMPSON:

"That Mr. E. CLEPHAN and Mr. T. C. LEE be elected auditors for the ensuing year."

Carried.

At the conclusion of the General Meeting a Council Meeting was held, and the following gentlemen were elected members of the Council to fill up vacancies, viz., Messrs. W. KEMPSON, E. F. COOPER, and G. R. KIRWAN, M.A.

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THE ROLL OF BISHOP HUGH OF WELLS FOR THE ARCHDEACONRY OF LEICESTER.

By Rev. J. E. Stocks, M.A. (Read before Section "A.")

It is well known, I suppose, to all the members of the Section, that the County of Leicester, though now in the Diocese of Peterborough, formed part of the Diocese of Lincoln, from a far-off date in the Middle Ages up to the year 1837. Consequently, if any one desires to study the records of the past, so far as they reveal the condition of the Mediæval Church in the town or county, it is at Lincoln that he will find them. There, happily, the Bishops' registers exist in excellent preservation from the early years of the thirteenth century to the great break of the sixteenth. There, too, in the rich and admirably-arranged muniments of the Dean and Chapter, is much that tells of Leicester and Leicestershire, the Prebend of St. Margaret's having been one of the oldest possessions of the great Church, and the Chapter having held property in this as in other counties for many centuries.

It is to one of the earliest of the Episcopal records, preserved at Lincoln, that I wish to call attention to-night. Having occasion, some few years since, to work steadily through the whole series for other purposes, I found that up to the year 1299 the Bishops' Registers were contained in rolls—one for each Archdeaconry—and it occurred to me that an abstract or *précis* of the earliest of these rolls for the Archdeaconry of Leicester would give a very fair idea as to the character of them all, and would show what Lincoln has to tell us which we do not already know from our great county history. I, therefore, copied all that was of importance in the oldest roll—that which begins in the eleventh year of the Episcopate of Bishop Hugh of Wells, who held the See of Lincoln from 1209 to 1235.

If any one is curious as to the Bishop himself he will find interesting notices of his life and work in the "Dictionary of National Biography," by Precentor Venables, and in the preface to a reprint of his, "Liber Antiquus de Ordinationibus Vicariarum," by Canon Perry. The son of a landed proprietor, he was chosen by King John for the Diocese of Lincoln after a time of spoliation, in the hope that he would be a pliant tool. But he turned out to be a man of independent spirit and force of character, though more of a statesman and good man of business than a theologian. His great work was the enforcing of proper provision for the vicars of parishes by the monastic bodies which held the rectorial property. In addition to this, he was a great builder and a man of energy and resource.

I. General character of the contents.

This roll contains the record of institutions to benefices, or parts of

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benefices, whether rectories, half-rectories, vicarages, chaplaincies, priorates, hermitages, or otherwise, from A.D. 1220 to A.D. 1235. This does not of course include every benefice in the town and county. Then, as now, the Episcopal register for a particular period would only contain references to those benefices in which vacancies occurred. In these sixteen years the following benefices are named:—Sytheston—Sideston (Syston), ii.; Louseby, iv.; Scarneford (Sharnford), i.; Gauby (Galby), ii.; Wytherlete (Witherley), i.; Kynemdescot (Kimcote), ii.; Hoghton (Houghton-on-the-Hill), i.; Beby (Beeby), i.; Ybestoke (Ibstock), ii.; Noveslia (Nosely), ii.; Sacreston (Shackerstone), i.; Turliston (Thurlaston), ii.; Essebi (Ashby Magna), i.; Houtheby, or Houby (Hoby), ii.; Remilde—Redmild (Redmile), ii.; Ethre (Heather), i.; Salteley—Sautby (Saltley), ii.; Beleton (Belton), ii.; Boseword (Market Bosworth), ii.; Gloreston (Glooston), ii.; Waletone (Walton-on-the-Wolds), i.; Lucteburg (Loughborough), iii.; Luterword (Lutterworth), iii.; Godesbeth (Goadby Marwood), ii.; Musterton (Misterton), ii.; S. Nicholas, Leicester, ii.; S. Peter's, Leicester, ii.; S. Michael's, Leicester, i.; S. Clement's, Leicester, i.; All Saints, Leicester, ii.; Brocton (Nether Broughton), i.; Stapelford (Stapleford), ii.; Lokinton (Lockington), i.; Kynelingeworth (North Kilworth), i.; Bugmenstre (Buckminster), i.; Overtona (Coleorton), ii.; Harstan (Harston), i.; Schadewell (Shawell), ii.; Botelesford (Bottesford), ii.; Sud Croxton (South Croxton), iii.; Parva Dauby (Lower Dalby), i.; Dixley (Dishley), ii.; Blastona (Blaston), i.; Cleybroc (Claybrooke), i.; Thurstaneton (Thrussington), ii.; Swithelund (Swithland), i.; Magna Petling (Great Peatling), i.; Scaftinton (Skeffington), i.; Barkeston (Barkstone), i.; Angodesthorp (Ozgathorpe), i.; Tokeby (Tugby), i.; Digesword (Disewerth), ii.; Swineford (Swinford), i.; Nayleston (Nailestone), i.; Slaston (Slawston), ii.; Kyrkeby (Kirkby Mallory), i.; Reresby (Rearsby), i.; Pekinton—Pakinton (Packington), iii.; Esseby (Ashby-de-la-Zouch), i.; S. Martin's, Leicester, i.; Esseby (Ashby Folville), ii.; Newbold (North Verdun), i.; Adlakeston (Allexton), i.; Endreby (Enderby), ii.; Seyle (Nether and Over Seal), i.; Stanton (Stoney Stanton), ii.; Stakethna or Statthern (Stathern), i.; Leyra (Leire), i.; Branceston (Braunston), i.; Saxeby (Saxby), i.; Belegrava (Belgrave), ii.; Foxton (Foxton), i.; Estwell (Eastwell), i.; Donington, ii.; Barewe (Barrow), i.; Prestwald (Prestwold), i.; Burton (Burton Overy), i.; Cnossington (Knossington), i.; Gutmundel (Gumley), i.; Haleton (Hallaton), i.; Briningehurst (Bringhurst), i; Sibbelsdon—Sibbesdon (Sibson), ii.; Humbrestan (Humberstone), i.; Sygleby (Sileby), i.; Staunton (Stonton Wyvile), i.; Hatthurn (Hathern), i.; Wykengeston (Wigston), i.; Lauchton (Laughton), i.; Anlepp (Wanlip), ii.; Sadington (Saddington), i.; Essefordby (Asfordby), iii.; Kyrkeby i.; Hungerton (Hungarton), i.; Conyngeston (Congerstone), i.; Drayton, i.; Muston, i.; Sproxton (Sproxton), i.; Dauby (Dalby Magna), i.; Cotes (Cotes), i.; Appelby (Appleby), ii.; Carlton, i.; Nonton (King's Norton), i; Outheby or Ouchby (Oadby), i.; Blaby (Blaby), i.; Croft (Croft), i.

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In addition to these places, all well-known to-day, there are several priories, notably Hinckley, and the Hermitage of Mirabel, which was in the parish of Skeffington. The total of places named amounts to 105, which must be more than one-third of the whole number, as at the present time there are only 251 benefices in the Archdeaconry. Thus this one roll covers a large space and gives a mass of varied information as to the state of the Church in the county.

II. How much of this information is new and how much is to be found in the history of the county?

When a county possesses such a vast store of facts as that which is contained in "Nichols' Leicestershire," it is natural to turn at once to that history and to make a careful comparison, parish by parish. The results of such a comparison may be summarised as follows:—

(1) The names of those presented to benefices and the names of their patrons are nearly all given by Nichols, and, with few exceptions, are given accurately. Occasionally there is a difference in the Christian name or surname—*e.g.*, in the case of Hoby the Clerk presented to the benefice in the twelfth year, is given by Nichols as *Stephen* of Kirketon, instead of *Ralph* of Kirketon. In that of Glooston it is Hugh de Paiton instead of Hugh de Saxton. In a few instances there is a distinct slip as to date—*e.g.*, under the parish of Blaby, Nichols gives a rector, by name Alured Slout, without date, between Geo. Rogers (1560) and Robert King (1561), on the authority of Rymer (vol. xv. p. 669). His real date, we find from this roll, is the twenty-sixth year of Hugh of Wells or 1235. But, on the whole, so far as mere names go, this record corrects very few of the details which were collected with such industry at the end of the last century and the beginning of this.

(2) But one thing becomes clear through such a comparison—viz., that though the general plan of parochial history is very faithfully carried out in Nichols throughout the county, the several contributors were left free to use whatever sources of information they could. In some cases—*e.g.*, Asfordby, Lowesby, Saltby, Barrow, and in Leicester itself, extracts are given either from the Lincoln registers themselves or from a MS. known as "Charyte's Rentale." But in the case of the great majority of parishes there is no reference to the authorities for the earlier names of rectors or vicars, and no evidence that those who compiled the local notices ever referred to any authorities of an original character. The result is that we have over and over again the mere name of the clerk instituted, under the head of "Rectors" or "Vicars" or "Free Chaplains," without even his rank in holy orders, which is almost invariably given in the roll, and without the picturesque and interesting little details which are really more instructive than the mere names.

A few instances will illustrate what is meant.

The first entry of all relates to Sideston, or, as we know it, Syston. In Nichols the name of Robert the Clerk, nephew of Stephen of Seagrave, is given with the date in the list of rectors. In the roll (which of course is in Latin) the entry is as follows:—"Robert, Clerk,

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nephew of Stephen of Seagrave, presented by the Proctor of the Earl of Winton to the church of Sidneston,—de Tebavvill who held it being dead. The said clerk is ordered to attend the schools, and to learn his duties and to practice the art of singing in the church, so that he may come to the Lord Bishop at the Feast of S. Michael to be examined as to the progress he has made in holy things, and if the Lord Bishop shall have good hopes of him he shall keep his benefice, but if not he shall forfeit it." In other words, Robert was not a rector in our modern sense of the word, but a clerk in one of the lowest of the minor orders, very likely under age. He was presented by his relative to the good things of the benefice, but he had to fit himself even for the minor duties of the Church, and as to the higher duties he might never get near them at all. In this particular case there is no evidence in the roll whether he did or not. The next entry in the twenty-second year simply records the institution of William Malore, without mentioning the previous rector. Another entry in the eleventh year relates to Ibstock. In Nichols Thomas de Verdun is given as rector, with the right date, presented by Robert of Garshal and Richard (instead of Rowland) de Verdun. In the roll he also is described as clerk, and it is added: "The said clerk is ordered to present himself at the next ordination to be ordained sub-deacon." He also was only an acolyte, or even lower in the scale, when presented to the benefice. In the case of Turliston (Thurlaston), about the same date, there is a similar entry with a significant addition. Geoffrey of Eketen, clerk, is ordered to come to be ordained sub-deacon, and "he must find a suitable chaplain for the duties of his benefice." In one interesting case, Ethre (Heather), Richard Arundel is instituted on the presentation of the Hospitallers with the obligation of residence and of serving there as a priest. To that end he is ordered to come, at the bishop's command, to be ordained from order to order until he is a priest. In the case of Walton-on-the Wolds, Hugh the Dispenser is instituted with the injunction that he is to come to be ordained acolyte, so that he may not even have received the lowest degree of holy orders, which, I believe, was called the "first tonsure."

Thus, without going very far into details, it will easily be seen that the information given in a record of this kind has by no means been exhausted, even by such workers as those who compiled our splendid county history, but that there is in such records a storehouse of facts as to the Mediæval Church which, if carefully studied, would give the ordinary student a better idea of its dealings with parishes than that which he usually obtains from the best historical summaries.

III. Following on the track which this comparison has opened out, we will now attempt to take a general view of the holders of these benefices at this period. There are in all 135 institutions to 105 benefices. They may be divided in the following way:—Under the order of sub-deacon (including all who are merely described as clerks) at the time of institution, 31; sub-deacons under that of deacon, 51; deacons under that of priest, 4; chaplains who would be in priests' orders, 43;

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description not given, 6. That is to say, 86, or nearly two-thirds, were not qualified when instituted to the benefices for strictly ministerial duties, for saying mass, for hearing confessions, for preaching—a striking picture of the state of the secular clergy in the early years of the thirteenth century. But there is one fact which should not escape notice in making this calculation—viz., that the greater number of the institutions of clerks in the lowest degrees of holy orders occur in the earlier years. At the conclusion of the bishop's time it is a rare thing to meet with one who is not at least a sub-deacon. The inferences are two. First, it is clear, as is pointed out by Bishop Stubbs and other historians, that a lax view of the relation between Church property and Church duty prevailed very largely in the Mediæval Church—here in Leicestershire as elsewhere. The lord of the manor, or the royal patron, provided for some relative or friend by presenting him, even when under age, to the benefice in his patronage, or to part of it. He might be only in minor orders, and he might never intend to take the real duties of a deacon or priest, but that did not prevent his enjoying the fruits of the benefice. It is not meant that the clerical duties, as we should call them, were left undone. On the contrary, chaplains or vicars already in office might not be disturbed in their rights and duties by the new rector, and he was often required to provide for them as a necessary condition of institution. But, if we wish to trace the origin of pluralities, of nepotism, of the divorce between property and responsibility in regard to the Church, we must not think that we shall find them only in the last century. We shall see them far back in the annals of the Mediæval Church, and trace in them one out of many causes which led to the great upheaval of the sixteenth century. On the other hand, the fact that things seem to get better in Bishop Hugh of Wells' time shows that influences were at work to counteract the evil to some extent. He is known to have been a good administrator, and one trace of his skill is to be found in the record which shows, by its simple statement of facts, that he was able to some extent to raise the standard towards the end of his life before he passed away, to be succeeded by a greater man and one more strenuous in the battle against abuses than himself—Robert Grosteste.

IV. I will now give one or two interesting extracts from the roll, each in itself an instructive glimpse into a far-off past.

(*a*) In the sixteenth year—1225—there is a record of the institution of a vicar or perpetual curate to Swinford, on the presentation of the Knights Hospitallers. Swinford was a "camera" or lesser house of the Order which had a larger establishment at Dingley, in Northamptonshire, about 12 miles distant. After the formal record of the institution of Antony of Winton on the presentation of the Prior of the Knights Hospitallers, the following particulars are given as to the rights of the vicar:—

"The Vicar of Swinford shall have his board honourably with the Hospitallers in that town, just as the preceptor of the brethren there is

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provided for. He shall have two marks yearly for his stipend, and all bequests to the value of sixpence; what is beyond that he shall divide with the brethren. He shall have his offerings on the four great festivals of the year, viz., on the Nativity, 3d.; at Easter, 2d.; and on each of the others, 1d., and generally all offerings made at Confession, with the exception of those which are made by way of restitution for tithes withheld. If an offering at his hand, when he is celebrating, comes to 1d. or less, it shall be his own; what is above 1d. he shall yield to the Hospitallers. He shall have a house, where, when needful, the parishioners can have suitable access to him, and he shall have his own horse at grass, fodder, and corn, just like the preceptor. Moreover, his clerk shall have his maintenance suitably like one of the Hospitallers of the house, and 10d. a year as wages; and the servant who makes his bed and sees to his horse shall be maintained like one of the servants of the brethren. The Hospitallers shall sustain all the due and accustomed charges of the Church. The archdeacon is ordered to proceed to induction so soon as the regulation as to the house, and other matters, are set in order."

(*b*) In the twenty-first year there is a record of gifts to the altar of S. Mary at Redmile, which illustrates not only the then prevalent custom of gifts to the Church, but also the tenure of property in land.

"John of Knipton has given to God and to the altar of S. Mary of Redmile two selions, in the fields of Redmile, in pure and free alms. Richard le Palmer (has given, &c.) 1 bovate of land with meadow and pasture. Wm. de la Turre, 3 selions. Roger, son of Robert the Chaplain, one selion. Richd. le Palmer, 1 acre of land. John le petit (Littlejohn (?)), 1½ acre of land and one rood. William the Chaplain, 4 selions. William le Palmer, 3 selions. Roger, son of John, 2 selions. Stephen de la Turre, 1 rood. Geoffrey and Alan de Starvile, 3 roods. Master Wm. de Botlesford, 8½ acres of meadow in the fields of Botlesford. Henry, son of Peter, 2 acres. John of Saxendal, 1 selion. Thomas of Newark, 1 selion. Robert of Offinton, 2 selions in the fields of Redmile. Regina de Madeley, 1 selion. Lord Wm. de Albiny, 1 bovate of land, with meadow, of his demesne, and pasture in the same, and 2 messuages, of which Wm. le Breton holds one in fee for 3s., and the other, Ywan de Altar, holds in fee for 2s. 2d. Gamelus (has given) 12d. rent in the town of Redmile. All the aforesaid have given the aforesaid to the altar of S. Mary by way of charity (and Lord Wm. de Albyn holds deeds of each) to maintain the service of the altar and also the chaplain there celebrating the divine offices. The sum of the forewritten lands is 4 bovates, less one acre, the sum of the meadow 4 acres and 3 roods, the sum of the pence 16s. 6d."

Wm. de Albyn, having procured the above provision with the consent of the patrons, the Prior, &c., of Belvoir, Wm. de Redmild, Chaplain, is instituted.

(*c*) Richard of Keton, Chaplain, instituted Warden of the Hermitage of Mirabel in the place of Elyas the Monk, excommunicated for his

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open and notorious excesses, in which state of excommunication he had remained incorrigible for more than a year.

(*d*) Nicholas the Clerk, presented by the Abbot and Convent of Croyland, is instituted to the Church of Beeby—'saving to the said monks their ancient and due pension.'

(*e*) Adam the Chaplain, collated by the bishop with the authority of his council, is instituted to Kynemdescot (Kimcote), 'saving to Master Wm. of Scaverneby his vicarage which he has in the said church.'

(*e*) The custody of the Church of Godesbeth (Goadby Marwood) is conferred on Walter de Clinton, presented by Nicholas de Clinton, so that the said Walter, for the seven years next ensuing, shall have a master continually in the schools, of whom he shall learn, and the master shall receive all the fruits of the benefice and shall provide all necessary things for the said Walter in the schools during the seven years. And Lord N. de Verdun shall present the master to the Lord Bishop on his next coming to Leicester on the Feast of S. Nicholas.

(*f*) William of Nepton, Clerk, presented by the Lady Margaret of Blaby, is instituted to a mediety of the Church of Misterton. 'Saving to Wm. of Blaculvell, Chaplain, his vicarage, which he has in the same, on the presentation of the said Wm. of Nepton, the parson. The said vicar, in the name of his vicarage, shall hold the whole mediety of the church, paying therefrom to the said Wm. of Nepton as the parson, 3 marks yearly by way of pension—sc., 20s. at Easter and 20s. at Michaelmas.'

The Abbot and Convent of Croxden, who formerly maintained their title to the said mediety, have renounced such title by their letters patent, declaring in the said letters that they have restored to the Lady Margaret the deed which she had executed for them as to the said patronage.

(*g*) Wm. of Eyton, chaplain, presented by the Abbot and Convent of Leicester, instituted to the Vicarage of S. Michael's, Leicester. He shall have in the name of his vicarage, each day of the Abbey of Leicester one corrody of a canon for his own use and the corrody of a saccarius (sack-maker) for the use of his clerk, and 20s. stipend.

(*h*) John of Saltby, acolyte, presented by the Abbot and Convent of Croxton, is instituted to the mediety of the Church of South Croxton, with the obligation of maintaining a vicar of serving *in propria persona* if the benefice is too poor to allow of this. He is to be ordained sub-deacon at the next ordination and is to show the utmost diligence in bringing about the reunion of the divided benefice.

(*i*) Ralf de Turevil, acolyte, presented by Hugh le Dispenser, installed to a pension of 3 marks, vacant in the Church of Loughborough, one of four portions belonging to the said Hugh as patron. He is ordered to frequent the schools, &c., on pain of being deprived of his pension.

(*j*) Reginald the Chaplain, presented by the Abbot and Convent of Lilleshull, installed to the perpetual vicarage of Esseby (Ashby de la Zouch) constituted by order of the Council. The vicar, with his clerk,

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shall be at the board of the said canons, and shall have fodder for his horse, and maintenance, when he goes to synod or chapter, and moreover he shall have 20s. stipend and what is reasonable as to bequests and the accustomed offerings, and shall pay the synodals only. The canons shall provide hospitality for the archdeacon, and sustain all the other due and accustomed burdens of the church.

(*k*) Wm. of Wales, sub-deacon, presented by Wm., son of Thomas of Leire, is instituted to the Church of Leire. King's letters received to the effect that Hugh de Bingedon has recognised the right of presentation and granted it to the said Wm. before the Justices in Eyre at Leicester.

(*l*) Richard de Stavenesby, sub-deacon, presented by the Prior and Convent of Norton, admitted to Donington. Letters shown from the Lord Pope Honorius allowing him to accept the benefice and hold it with those already in his possession.

(*m*) Burga, Nun of Langley, elected prioress of that house by the Convent, enquiry first made by Master Thomas de Verdum, Official of the Archdeacon of Leicester, and G., Dean of Leicester, according to the accustomed articles, and Robert of Tatteshall, patron of the said priorate, giving his consent, is admitted and canonically instituted prioress and the Archdeacon of Leicester, is enjoined to see to her installation. The convent and others of the said house are ordered to be attentive and obedient to her as prioress.

(*n*) Simon of Penne, sub-deacon, presented by the Prior and Convent of Luton, admitted to the Church of Wykengeston (Wigston). Letters received from 'Master Stephen, Ambassador of, and Chaplain to the Lord Pope, to the effect that, notwithstanding his inhibition, the bishop should freely admit and institute the said Simon canonically presented by the prior and convent.'

(*o*) John de Capell, presented by the Abbot and Convent of Lyra to the Priorate of Hinckley, vacant by the resignation of Richard de Capell, conveyed by letters under the seals of the Bishop of Evreux and the Abbot of Bec, and R. de C.'s inability to return to these parts being proved by his own letters and by suitable witnesses, is admitted to the priorate.

(*p*) William of Leicester, Chaplain, presented by the Abbot and Convent of Croxton to the portion of the Church of Sproxton, which was Roger Blund's, is admitted with the obligation of the vicarage. 'The said portion consists in all the tenths and spiritual incomings from the fee of John of Sproxton in the said town, and is worth 6 marks.'

Conclusion.—It is not easy to paint in brief space the picture of the Mediæval Church which is given by a succession of records such as those which have been given. We seem to see in the facts stated, without any settled plan or grouping, the many-sided features of an ecclesiastical life as busy as that of our own day in some respects, very different from anything we can see around us in others. The pope with his dispensation, the bishop with his council and powers of inhibition, the archdeacon going his round of visitation at the charges of those

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whom he visited, the abbot, the prior, the prioress, the foreign prelates and their proctors in England, and all the picturesque personages of olden times come one after another on the scene. In their persons we see represented the complicated system of Church property—the monasteries with their tremendous grip on it,—thirty-seven being concerned in the institutions of this one record, in all parts of England as well as in Normandy and other parts of what we now call France—the great nobles, those other depredators of benefices who evidently understood the duty of providing for those of their own household, the whole system of papal provisions and dispensations, the pious gifts of the clergy and their parishioners alike, side by side with the alienation of the things given to other than sacred uses—all this, the theme of mediæval historians, is abundantly illustrated. Yet it would be unjust to say that these records reveal nothing but abuses. To an unprejudiced mind they show businesslike method and thoughtful care on the part of responsible statesmen and rulers; that might was not altogether right even in those lawless times, but that law and justice had their say, and strong, just men strove to redress abuses so far as they saw how to do so, suiting their remedies to the rough state of men and things with which they had to deal. Thus the study of the actual facts which lie in such abundance in our quiet cathedral cities, as in our national literary storehouses, is no piece of mere antiquarianism. It is the study of real life, like, yet unlike, our own, and the thoughtful student is ever seeing deeper causes for changes and difficulties in his own day, together with valuable lessons for action or for plan in regard to his own time.

In conclusion, I should like to plead for a closer attention to actual records, as distinct from reflections or arguments, on the part of our literary and antiquarian societies, and of the custodians of the records of the past. In this respect our own town and county are rather behind hand. The neighbouring town of Nottingham, with records inferior, it is said, to those preserved in our own muniment-room, has found it possible to publish several valuable volumes under able editorship. The Archæological Society of Yorkshire has already published fifteen or sixteen volumes of original documents full of new light on the history of the county. The Lincoln Record Society is steadily engaged in adding to the stores of published facts as to the families and institutions of that large and important part of England. When will Leicester and Leicestershire be energetic enough to follow these good examples, and to enhance the value of its unrivalled county history by the production of authorities and records which most of the unwearied compilers of that monumental work had little chance of knowing or using?

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STINGS AND POISON FANGS.

By F. T. Mott, F.R.G S. (Read before Section "D.")

Among the weapons of defence and of offence possessed by living creatures, whether animal or vegetable, the Sting and the Poison-fang are perhaps the most effective, the most remarkable, and at the same time the rarest. Among plants, stinging hairs are not found in more than about 20 genera, while in animals the true sting is confined to the Hymenoptera (bees, wasps and ants) among Insects, and to the scorpion among Crustacea; and the poison-fang to snakes, spiders and centipedes.

These venomous weapons are both designed upon the same principle. A small glandular bag secretes the irritant liquid which is ejected by a tube with a finely sharpened point, being forced up the tube by pressure as the point pierces the skin of the enemy or the prey. I have not been able to meet with any special treatise upon this subject, and after some inquiry and research I have only found five Orders of plants in which true stings are developed. Of these, *Urticaceæ*, the Nettle Order, stands first. Nettles of various kinds are widely distributed over the world. They were well known to the Romans who called them *Urticæ*, the "burning" plants, from *uro*, to burn. The Order *Loasaceæ*, peculiar to America, and mostly to South America, consists chiefly of climbing plants commonly known as "Chili Nettles," and covered with stinging bristles.

In the Order *Malpighiaceæ* the typical genus, *Malpighia*, contains several stinging species, especially *Malpighia urens*, an evergreen shrub, the fruits of which are eaten in the West Indies and are called Barbadoes Cherries.

The stinging hairs of this plant are very peculiar. They lie flat upon the bark, fixed by their swollen centres, with two points projecting in opposite directions.

The Order *Euphorbiaceæ* contains two stinging genera, both tropical, viz.: *Tragia* and *Jatropha*, one species of the latter furnishing the root from which manioc and tapioca are made.

Finally, there is one species of the Mallow Order, *Sida urens*, which has stinging hairs.

This completes, as far as I know, the list of stinging plants. Probably there may be others of which I have at present no information.

There is a genus of *Leguminosæ*, viz.: *Macuna*, or *Dolichos*, or *Stizolobium*, which has the pods of several species covered with brown hairs, which are very brittle and finely barbed at the points. These hairs easily shake off, and, falling on the skin, set up a terrible irritation. Hence they have been called "stings" in popular language, but it is believed that their action is purely mechanical and not due to any irritating secretion.

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The stinging hair or bristle of the common nettle, *Urtica dioica*, may be taken as a type of the true sting. It consists of a single elongated cell, swollen at the base and tapering to the fine point which is crowned by a little knob set on obliquely. This knob acts as a stopper to the delicate phial of poison which cannot escape until the stopper is broken off. Its oblique position makes it more easy to break off, and insures the proper action of the point. Any object pressing downwards upon the point of the sting would naturally snap off this oblique projection, and be then in the best position for receiving the stab of the sting. It seems very difficult to believe that such ingenious but minute arrangements have come about by any unconscious process of natural selection.

There are three species of nettle found in Great Britain, and common to Europe, North Africa and Western Asia. The sting of the great nettle, *Urtica dioica*, is the feeblest in its effect. That of the small nettle, *Urtica urens*, is a little more irritating, and the Roman nettle, *U. pilulifera*, is the most virulent of the three. But there are some foreign plants of this Order whose stings are still more formidable. *Urtica crenulata*, an East Indian species, produces great pain with sneezing and symptoms of tetanus. In the island of Timor there is a species called Devil's-leaf, *N. urentissima*, the effects of whose sting are said to continue for twelve months. Another species, *U. heterophylla*, is thickly covered with large ferocious-looking stings, which give great pain, soon, however, passing away. In New South Wales there is a huge Nettle Tree, *Laportea gigas*, with a trunk 50 to 100 feet high, and four to six feet thick, a very large spreading head, and leaves a foot in diameter. The stings with which this tree is armed produce wounds which are often dangerous and have occasionally proved fatal.

The Order *Urticaceæ* contains about 10 genera in which stinging hairs occur, and 30 others which are not so armed; but there is no other Order so conspicuous for its stinging tendencies.

The *Loasaceæ* stand next in order. The genus *Loasa* consists of half-a-dozen species that twine about the trees of the Peruvian and Chilian forests, hanging in tangled ropes, and repelling the traveller who tries to make his way through them, by their irritating stings. In the few stinging species of the other three Orders, *Malpighiaceæ*, *Euphorbiaceæ*, and *Malvaceæ*, there is nothing very remarkable.

There does not seem to be any very apparent reason why the few genera mentioned should possess stinging hairs, while all the rest of the vegetable world is not so armed. Is it any advantage to the nettle that these hairs should grow upon it? They are a very poor defence against man; they may be some defence against browsing animals, but the abundant seed and the creeping roots would secure the life of the species even if the plant were a favourite food of cattle. They do not protect it against caterpillars, for the larva of the Tiger-Moth creeps fearlessly among them and feeds upon the leaves.

It ts equally difficult to see why the ropes and festoons of the Chilian Loasas should be thus armed, or why the great Nettle Tree of

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Timor should need such protection. But it is curious that in four of the five Orders in which stinging hairs occur, the *climbing* habit is more or less developed. The Loasas are all climbers, so are most of the *Malpighiaceæ*, the genus *Urera* among the *Urticaceæ*, and the genus *Tragia* among *Euphorbiaceæ*.

The *Urticaceæ* and the *Malvaceæ* are also remarkable for the fibrous nature of the inner bark of many species, which take the place of hemp for rope-making in some parts of the world.

Whether there is any connection between these facts and the development of the stings, I am not prepared to say.

Turning now to the animal world, the only creatures within my knowledge which possess stings, are the scorpions, and the bees, wasps and ants. In all these creatures the sting is placed at the extremity of the abdomen, and its structure is essentially the same as that of the stinging hair, but the sting of insects having also to serve the purpose of an ovipositor in the females is a much more complicated instrument, the simple tube being divided into three bristles, one of which is grooved, while the other two lie over the groove and so complete the channel. In all these animals the sting is useful as a defence. In the sand wasps it is also used to stupify the grubs which they carry to their nests as food for their young, and the scorpions kill their prey with their stings before eating them.

The poison-fangs of spiders, centipedes and snakes are precisely of the same nature as stings, only that they are placed at the other end of the body. Scorpions are closely allied to spiders, belonging to the same great class of *Arachnida*, and the fangs of spiders are used for the same purpose of destroying their prey as the stings of the scorpions. The spider's fang is a stinging tooth instead of a hair, although as spiders have no bones the tooth is probably composed of chitine instead of dentine. The fangs of the centipede are formed by an alteration of the foremost pair of legs. The spiders and centipedes approach the snakes, which are the most highly developed animals in which poison is used at all as a weapon, in that they have two of those venomous stings instead of one only. In the most venomous snakes, and also in spiders, the fangs are folded down when not in use, but in those Colubrine snakes which have poison fangs they are permanently erect.

There is another class of animals, some of which are said to possess stings, viz.: the hydrozoa, or polyps. The common hydra ejects from his body a kind of stinging hair which seems to have an effect upon other living creatures, and the *Medusæ*, or "jelly fish," eject similar hairs from groups of minute glands upon their skins. But these hairs are all barbed at one end, and act when separated from the body of the animal ejecting them. It is doubtful therefore whether they are really venomous or only irritate by mechanical laceration. They may of course carry venom on their surfaces or even concealed in the barbs, but this has not yet, I believe, been demonstrated.

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There is also a fish called the Sting-ray, which inflicts wounds from a formidable spine on the tail, but there seems no reason to suppose that there is any poison associated with this weapon.

Whether the blood-sucking insects, of which there are many, produce their irritating effects by simple laceration, or whether any poisonous fluid is concerned in it is still disputed. The mosquito and gnat which are not specifically distinct; the flea, the bug, and the Tsetse fly, all pierce the skins of animals and live upon their blood, and the effects of the operation are such as to suggest the injection of poison; but no poison gland has been discovered, and the weapon used, which is similar in all of them, is not a tube but a lancet, and does not come under the definition of a Sting or a Poison-fang.

Among our British spiders there is no species whose fangs are at all formidable to human beings, but there is a species in the Island of Elba, the 13-spotted Aranea, whose bite is said to be sometimes fatal even to man; there is another very venomous one in Morocco; and the famous Tarantula of Southern Italy, which has a body nearly an inch in diameter, is really a creature to be avoided, although the exaggerated effects attributed to it are fabulous.

There is a good deal that is mysterious about the action of poisons of all kinds, and this mystery is enhanced in the case of organic poisons, because it has been found impossible, hitherto, satisfactorily to analyse them. No one can say to what substance the poisonous action is due. Formic acid is found in some of them, so is bicarbonate of ammonia, but neither of these substances alone will produce the precise phenomena of a sting or snake-bite. Ammonia is a useful remedy against these poisonous wounds, but it is not clear whether its action is to neutralize an acid, or merely as a rapidly diffusible stimulant, or whether like oil it only excludes the oxygen of the air. The rapidity of the action of these Organic poisons is astonishing. Small creatures are often killed instantaneously. A man will sometimes die from a snake bite in a few minutes. It has been found that the blood of animals killed by a Viperine snake will no longer coagulate, while the poison of a Colubrine has no such effect. The Colubrines have narrow heads with large plates upon them. The Viperines have triangular heads, broader behind, and covered with small scales. My own belief is that the organic poisons are highly concentrated stimulants, that their action is simply on the nervous system, that they are very unstable compounds, giving up their concentrated energy with such explosive rapidity to the nerve substance, that it is quite unable to convey it along the nerve threads fast enough, and is therefore at once shattered and destroyed, like an insufficient conductor by the passage of a lightning flash.

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NOTES ON SOME EAST ANGLIAN BIRDS.

By L. Creaghe-Haward. (Read before Section "E.")

Why is it that so little is known of this quiet corner of our island? Why is it that sight-seers are obliged to go to Scotland, to Wales, to Norway and Sweden, and half a hundred places beside, when so much lovely scenery lies, as it were, at their very doors? If it be necessary for a man's happiness that he see mountains and hills, ravines and precipices, he need not travel down to us, but if his desire be for woodlands in the beauty of early spring or in the gorgeous gold of autumn, for placid rivers "slowly sliding" by many a peaceful hamlet and village, for quiet nooks hidden from the sight of the vulgar—then in East Anglia shall he have his heart's desire. There still bloom rare flowers as they have done for centuries past; there still do many of the woodland butterflies flaunt their many-hued wings in the summer sun; there do curious birds yet dwell, whose haunts are known but to the naturalist.

As I sit, with the rain driving against the windows and the south-west wind soughing softly round the house, a scene rises before me as I saw it years ago in my boyhood. A gray old castle rising on a hill-top among the trees, the walls half hidden in the ivy greenery, the square tower of a Norman church peeping out on its left, and below them one of those meres so familiar to the East Anglian, are all, and yet that all is still to me one of the fairest sights that I have ever seen. Not all the hills of Derbyshire, not all the rugged Cornish coasts, not all the brawling trout streams of Northern England convey to my mind such a sense of quiet happiness as that. The old castle overlooked a sleepy town, which seemed to have no connection with the outside world. It was reached by a railway which was as sleepy as the town. Those who travelled by it, the station officials, the very porters, were never hurried. The train slowly wound its way through fields of golden corn, with the cloud shadows rippling over them, by sunny woodsides where the pheasants sat undisturbed under the banks, through deep sandstone cuttings covered with the yellow flowers of golden rod, of hawkweed, and many another flower, till at length it drew up in the little station standing among green meadows away from the houses. The passengers leisurely alighted, strolled up the platform, through a little door, and so on to the high road. I wonder whether the old town is the same as it was in those bye-gone years, or whether this bustling nineteenth century has invaded this far away spot, driving away its old world quietude. I wonder, too, whether the ragged robin still covers the green meadows by the mere in spring with a pink flush as of early dawn. Does the yellow iris still fringe the water's edge with its bayonet-like leaves and the golden flowers gleaming here and there? Are the blue forget-me-nots

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that bloomed by the dyke sides all gone? What a lovely place that water-side was when last I saw it, under the rays of a hot June sun, some ten years ago. The sunlight gleamed on the lichened walls of the Norman keep and on the glossy ivy leaves, while here and there great masses of wild roses hung from crevices in the walls overhead, filling the air with perfume. Lower down by the mere were the irises in their summer beauty, while late orchids purpled the meadows round the waters. The great water-dock showed red and brown among the green leaves,—its huge masses shading the deep pools where the pike lay lazily. Fussy moorhens floated in the open stream, surrounded by little balls of brown fluffy feathers, ready to dive under the bank at the least alarm. Dragon flies of all shades and colours flashed by in the light, and in the background stood the cattle under the shade of the trees which skirted the far side of the landscape. The nightingale no longer "rung Eden through the budded quicks," but the sedge birds yet chattered among the reeds and lush grasses, while still the cuckoo's call echoed from side to side. The air was full of the murmuring of innumerable wings of insects, which passed and re-passed "like golden boats on a sunny sea." The marsh marigold was gone, but the yellow ragwort took its place, and the breeze, as it swept over the quiet fields, brought the scent of meadow-sweet and early honeysuckle with it. Presently, as the drowsy afternoon wore on, the moorhens came out more boldly from their lurking places, and a duck or two peered cautiously from the rushes. Then, when the declining sun sank yet lower in the west, and the long shadows lay across the greensward, the rabbits came from the hedgerows to play in the last rays of light; and when the evening mists rose from the lowlands the querulous calls of waterfowl were heard all around. The swallows were off home, but the late-flying swift was still abroad, hawking for insects in the evening dusk. The white barn owl sailed slowly round the tall poplars, and its shrilly scream was answered by its mate far away. The night-jar droned sadly from the long copse beside the castle, and bats flitted by in the dim light. Soon all the day-loving birds and animals were gone to rest, and the night-flying moths fluttered round the flowers whose white petals gleamed amid the darkness. No sound of man stirred the stillness,—the barking of some distant sheep dog alone telling that farms and hamlets lay around. Then, with the silver light of the moon just edging the low banks of cloud on the horizon, came a gentle breeze softly sighing over the fresh fields and swaying sedges, and so the night swiftly glided by till the eastern sky was once more flushed with the glow of coming day, and the birds woke the silence with songs and twitterings again. Not less lovely was this peaceful spot seen in the late year when the autumn leaves "had put their glory on," but there was a strain of sorrow then that was wanting in the glorious summer days. Trees, hedges, reeds, all alike touched with marvellous colours from the magic palette of that great master-painter Nature, flashed their gorgeous hues in the "slant sun rays." Here the maple fences burned golden in the spears of sunlight, there the

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brown beech showed russet by the oaks, which alone kept their summer verdure. The iris flowers had faded and the tall ragwort stood in seed, but the great spikes of dock covered the mere with a deep red mantle. The snipe were there, feeding by the springs or twisting rapidly from pool to pool. The grey crow croaked mournfully as he flew from copse to copse, and the jays screamed harshly from the hazel bushes, now laden with clusters of brown nuts. The squirrel was busy gathering his store for the coming frosty days, and the dormouse had prepared for himself a cosy nest of dead leaves, in which to sleep away the winter. The summer birds were already in warmer climes, and flights of duck and geese passed overhead by night in the chill October moonlight, on their way from the far north. The bright bits of colour fell slowly from their parent stems to their last sleep on the brown earth, and the first wind that swept across the fields left the trees leafless and bare till another spring should arise. Then the keen frost crisped the rippling surface of the December floods, and the skater's steel-shod feet glanced merrily across the ice. The sound of bright laughter and the ring of skates came up to the old church tower, where the bells chimed cheerily over mere and meadow, singing of the birth of the Christ child. The old year faded away, and the new year came in amid frost and snow, which in their turn gave place to the February rains. Next the first March violet shewed itself on the mossy bank, and the missel thrush's wild welcome was heard in the elms. The mere began again to deck itself with garlands of flowers to greet the swallow and the nightingale. The earth once more clad itself in bright apparel, the time of the singing of birds had come, and the voice of the turtle was heard in our land.

For the greater part of my life I have lived in various parts of Suffolk, among scenes such as I have endeavoured to paint to you, and I have here and there come across a rare bird, or obtained an unpublished note of some curious fact relating to birds. A few of these notes I venture to read to you to-night, hoping that they may not prove altogether uninteresting.

Among the thrushes *Turdus viscivorus*, Linnæus—the Mistletoe Thrush—and *T. musicus*, Linnæus—the Song Thrush—are common everywhere throughout the year. The Mistletoe Thrush, often passing in East Anglia by the name of Storm Bird, is at all seasons, except when it is breeding, very shy. Then, however, it lays aside its shyness, and its nest may often be found quite low down, close to a house or public path,—a confidence in human nature which is often misplaced, for no egg is more common in boys' collections than that of the mistletoe thrush. With autumn, "laying its fiery finger on the leaves," come *Turdus iliacus* (Linnæus)—the Redwing, and *T. pilaris*, Linnæus—the Fieldfare, the former often drawing very near to the villages and small towns. *Turdus merula*, Linnæus—the Blackbird, is also, I think, partially migratory. This last bird seems to often assume pied plumage, several examples having come under my own notice. I also saw at Wherstead in 1881 a cream-coloured variety of the Mistletoe Thrush.

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After a very hard winter some years ago, in which all the thrushes suffered terribly, scarcely a solitary song-thrush was to be seen, and but few blackbirds, but by the following spring there were as many as ever. One or two Ring-Ouzels—*Turdus torquatus*, Linnæus—were to be seen nearly every year from 1877 to 1888 at Wherstead, usually in autumn, sometimes in March. This bird, though a lover of mountainous districts, is more common with us than might be expected; in fact it is a regular autumnal and spring migrant. (*Vide* Newton's "Yarrell," i., 287-8.)

The Wheatear—*Saxicola œnanthe* (Linnæus)—is local, but it is to be met with every year, though in the districts with which I am most familiar it does not appear to breed. Anyone who has passed over the heaths lying near the Suffolk coast, when the gorse covers the land as far as eye can see, with golden gleam, must have noted the Whinchat—*Pratincola rubetra* (Linnæus). Curiously enough, on a small heath at Wherstead the Whinchat never bred, but the Stonechat—*Pratincola rubicola* (Linnæus)—returned thither year by year, and was visible all the summer through. I believe the latter bird to be distinctly the more common of the two in Eastern England. The Redstart—*Ruticilla phœnicurus* (Linnæus)—need never be sought for in vain in the summer months. It has been very common indeed during the past two or three years near Ipswich. That pugnacious bird, the Robin—*Erithacus rubecula* (Linnæus)—abounds of course. In 1884, at Framlingham, I found a redbreast's nest with pure white eggs, but, as they were almost hatched, I did not take any. Besides, we had at school a superstition against taking robin's eggs, and to that superstition many a robin's nest owed its safety. A fighting bird is this, but on one occasion in the winter of 1882 I saw a great Titmouse—*Parus major*, Linnæus—attack and kill a robin, and then proceed to pick out the brains from the skull.

Almost every copse and spinney holds its Nightingale—*Daulias luscinia* (Linnæus)—and its rich liquid song rings from every side whither you turn your steps, ceasing neither in the hot glare of the midday sun nor in the depth of the dewy fragrant night. At Wherstead the first nightingale always sang in a plantation by the village, and sometimes he would be heard for a week before any other appeared in the neighbourhood. Many people seem not to distinguish the nightingale when he sings among a host of other birds in the broad daylight, and it is only when the shadow of night lies over the land, and the nightingale's song rises clear and full through the dew-laden air that they know his lovely tones. On the other hand, nearly every year some enthusiastic lady informs me about February or March that she has heard the nightingale, and as she is generally positive, knowing the notes of the bird so well that she could not mistake them, it is useless to offer any remark.

Both the Whitethroats—*Sylvia cinerea* (Bechstein), and *S. curruca* (Linnæus)—abound everywhere. They are known in Suffolk by the name of "Hay Jack" and "Nettle Creeper." Once, while lying behind some bushes at Little Blakenham shooting wood-pigeons, a young lesser

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whitethroat perched on the barrels of my gun, which projected through the boughs, and remained some seconds before noticing me.

The Blackcap — *Sylvia atricapilla* (Linnæus) — almost rivals the nightingale in the richness of his song, but his notes are feebler and so not as often observed. Still he may always be met with in Suffolk and Norfolk in the breeding season by those who know how to use their eyes. The Garden Warbler — *Sylvia hortensis* (Bechstein)—is often unnoticed, but must not be regarded as at all uncommon with us.

The Goldcrest—*Regulus cristatus* (Koch)—is not plentiful, except in winter, when large numbers arrive and may be seen chiefly in the fir plantations so abundant in East Anglia. It does nest regularly, but I have only found two nests, and neither time was I lucky enough to obtain an egg. Every spring the monotonous notes of the Chiffchaff—*Phylloscopus rufus* (Bechstein)—in the tall trees herald the spring, and throughout both counties its nest, as well as that of the Willow-warbler —*Phylloscopus trochilus* (Linnæus)—may be found by him who will carefully search for them. Since the draining of the reed-beds, in many places the Reed-warbler—*Acrocephalus streperus*, (Vieillot)—has become an uncommon bird, but by many a lonely pool the reeds still support its beautiful nest, on which the bird will sit even when blown almost horizontal by the wind. By every sedgy ditch and pond in the Eastern counties is heard the chatter of the Sedge-warbler — *Acrocephalus phragmitis* (Bechstein)—and among the tall grasses and low shrubs by the dyke sides does it build its nest. The notes of the Whitethroat are often taken for those of the Sedge-warbler, but the latter must nevertheless be chronicled as very common. The Grasshopper Warbler—*Locustella nævia* (Boddært)—is not often seen, from its habit of creeping about in the hedge bottom and under the herbage, but from the many notes I have from different places I think it cannot be rare. Of the Hedge Sparrow—*Accentor modularis* (Linnæus)—I need say nothing, but pass on to the Tits. The Bearded Tit—*Panurus biarmicus* (Linnæus)—is now becoming very scarce, as the marsh lands disappear. In Norfolk it probably still breeds, but in Suffolk it has doubtless ceased to do so. (Babington, "B. of Suff." p. 65.) My latest note is of a male taken at the King's Fleet, Dec. 24, 1885, and a female was seen there in Feb. 1886. Tradition says that they used to breed there, and it is not impossible that they may do so yet. Of the Paridæ nests and eggs of *Acredula rosea* (Blyth)—known among the country people as Puddingpoke, presumably from the form of its nest—*Parus major*, Linnæus; *P. britannicus* (Sharpe and Dresser); *P. palustris*, Linnæus; and *P. cæruleus*, Linnæus, have often come under my notice, and so far as I have seen they are all common, except perhaps the first named, which is local in some districts. Reaching the Wren — *Troglodytes parvulus* (Koch)—the finding of a cuckoo's egg in a nest of this bird is perhaps worthy of record, and also the occurrence of pure white eggs, somewhat large for the bird, at Wherstead in 1887. A pair of them is still in my possession. The Pied Wagtail—*Motacilla lugubris* (Temminick)—is

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commonly distributed, and *M. melanope* (Pallas)—the Grey Wagtail—may be met with in fair numbers in the winter, but Ray's Wagtail—*Motacilla raii* (Bonaparte)—seems to be somewhat local, in one parish always to be found plentifully, and in another, Wherstead for example, to be very rarely met with. As a boy at school I frequently took the eggs of both Meadow Pipit—*Anthus pratensis* (Linnæus)—and Tree Pipit—*A. trivialis* (Linnæus)—and they are to be met with frequently in every district.

Among the shrikes I have notes of two species—*Lanius excubitor*, Linnæus, and *L. collurio*, Linnæus. The former, the Great Grey Shrike, is rare with us, and the only time I have observed it was on Jan. 10, 1892, sitting on a tree in the meadows at Bramford, near the railway. The unmistakable appearance of this bird and the short distance I was from it, make me confident that I was not in error. The Red-backed Shrike is fairly abundant, but at Wherstead never appeared till after the breeding season, when a few young birds would usually come to the parish. In the Bury Museum is a female specimen in male plumage, shot by Mr. Creed, of Mellis. The Spotted Flycatcher—*Muscicapa grisola*, Linnæus—is very common, but the Pied—*M. atricapilla*, Linnæus—is distinctly a rare bird. It is said by Stevenson ("B. of Norf." i., 58) to have nested by Fritton Broad, but there is no authenticated instance of its having bred in Suffolk. The Swallow—*Hirundo rustica*, Linnæus; the Martin—*Chelidon urbica* (Linnæus); and the Sand-Martin—*Cotile riparia* (Linnæus)—are all abundant. In my school-days the two former species used to collect in huge numbers on the roof of Framlingham College before they took their flight into warmer countries, and sometimes a few would stay long after all the rest were gone. Five Martins were playing round the College chapel on Nov. 24, 1883, but were not seen after that day. The Tree-Creeper—*Certhia familiaris*, Linnæus—or Bark Runner, as it is locally termed, may be met with at all seasons, but this can no longer be said of my next bird, the Goldfinch—*Carduelis elegans* (Stephens). It was once common enough, but thanks to the ravages of birdcatchers it is far scarcer than of yore. It is still to be met with in small parties in spring and autumn, but the bird-men know its favourite haunts among the thistles, and numbers are taken annually by them. By those who watch the alder trees little flocks of Siskins—*Chrysomitris spinus* (Linnæus)—are often observed, and they are birds with small fear of mankind. A party of 13 or 14 allowed me last January to walk within five yards of them as they climbed about some birch trees on the railway embankment at Bramford. The Greenfinch—*Ligurinus chloris* (Linnæus)—is always abundant, winter and summer alike, but the Hawfinch—*Coccothraustes vulgaris* (Pallas)—though not actually a really rare bird, is not very common. I have five or six notes of its appearance, always in the winter months, but my father, Captain Haward, informs me that he has taken the eggs at Bramford. (Babing., "B. of Suff." p. 83.) Once a farm labourer called my attention to what he described as some "master

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grut olps" on his damson trees, but they proved to be Hawfinches, nine in number. The House-sparrow—*Passer domesticus* (Linnæus)—has increased very largely of late years, greatly owing, I think, to the destruction of hawks and other birds of prey. This bird will breed in almost any situation, in thatched roofs, holes in trees, branches of trees, under tiles, in martin's nests, and indeed it is almost impossible to mention any place in which a bird's nest could be placed, except on the ground, which sparrows will not use. At Blakenham they nest in large numbers in holes in the sides of the chalk-pits, often within a few feet of a kestrel's nest. Last year I saw a kestrel's nest in a hole in a chalk-pit, and not more than two yards away a stockdove was breeding, while sparrows swarmed in the crevices and holes around. The doves and sparrows sat unconcernedly on the face of the chalk wall, while the hawks wheeled overhead, or sat lazily in the sun close by. The Tree Sparrow—*Passer montanus* (Linnæus)—is very capricious in its coming and going. Dresser ("B. of Europe," iii., 598) says this bird is common in East Anglia, but so far as my experience goes it seems to be decidedly local. In winter it often appears in large flocks, and in firing at sparrows on the ground, out of thirty or forty killed more than half would sometimes be tree sparrows, while again I might not kill one tree sparrow in half a dozen shots. This would be in the winter, of course, for in the summer, though distributed all over the district, it is not very plentiful anywhere, so far as I have seen. A common school-boy error may be noted here, *i.e.*, that of imagining that because a sparrow built in a hole of a tree it was necessarily a tree sparrow. The eggs of both sparrows vary largely. In the Ipswich Museum is a small collection of eggs of *P. domesticus*, given by my father, varying from pure white to uniform dark brown. The eggs of *Fringilla cælebs*, Linnæus—the Chaffinch, another of our very common birds, vary greatly both in ground colour and in markings, though principally in the latter, some not being marked at all. Our next bird, the Brambling—*Fringilla montifringilla*, Linnæus—is a winter visitant only. It is often to be found on stubbles, and round stacks in hard weather, but I have never seen the large flocks spoken of by Babington ("B. of Suff." p. 77). As a schoolboy collector, I remember another error we all firmly believed in, viz, that there were two distinct species of the Linnet—*Linota cannabina* (Linnæus)—the grey and the brown, and I find this idea is prevalent with most boys. In 1886, a white specimen of this bird was procured at Wherstead. The Lesser Redpole—*Linota rufescens* (Vieillot)—I have seen every winter and autumn, often finding them on the dead stems of the Willow-herb (*Epilobium*). One bird that has greatly increased since the passing of the Wild Birds' Preservation Act is the Bullfinch—*Pyrrhula europæa* (Vieillot)—and it is now very abundant in Norfolk and Suffolk, although gardeners wage incessant war on it for the harm it does to the buds.

Coming to the Crossbills, I find two records of *Loxia curvirostra*, Linnæus. The first is that of a small flock of five or six seen in a wood at Little Blakenham in January, 1890. They were very busy on some

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tall fir trees at the north end of the wood, and I stood under the trees for some time watching them. They only remained there one day, nor did I see anything more of them in the neighbourhood, though I looked carefully several times. My second instance of the occurrence of this bird was on Sunday, Aug. 30, 1891, in the Rectory Garden, Great Blakenham. My attention was first called to it by its oft-repeated note, which I did not recognise, but on drawing closer I identified the peculiar form of the Crossbill immediately. It allowed me to approach within some eight yards, and I could distinctly see every movement it made. I observed that it was very red in plumage, and it was therefore presumably an old cock bird. The Corn Bunting—*Emberiza miliaria*, Linnæus—and the Yellow Ammer—*E. citrinella*, Linnæus—are both very common—the latter being found in every field. At Saxtead, in 1883, I found a Yellow Ammer's nest containing two or three ordinary eggs and one very large one. The large one contained a second egg, small but quite perfect. Of the Cirl—*E. cirlus*, Linnæus—and Ortolan Buntings—*E. hortulana*, Linnæus—I have no notes. The Cirl has probably never occurred in Suffolk (Bab., "B. of Suff." p. 76), and Mr. Stevenson thinks there is only one instance of its occurrence in Norfolk. The Ortolan has been killed several times, but no doubt these were usually escapes from confinement. The Reed Bunting—*E. schœniclus*, (Linnæus)—can be seen slipping in and out of the rank water growths by every mere and broad. Its eggs are subject to great variations, and in many cases it is practically impossible to say what its eggs may be, unless a glimpse of the bird or the situation of the nest gives you a clue.

The Starling—*Sturnus vulgaris*, Linnæus—is said by Babington (p. 86) to have been formerly more abundant in Suffolk than now, and presumably the same remark would apply to Norfolk. Still it is somewhat difficult to credit this when every autumn such huge flocks are seen all over the counties. It is very curious to note in the evening as they go to roost the sudden stop in the chatter and noise overhead, as if at some given signal every bird had hushed its voice, and for a few seconds there is a dead silence, and then they all begin together again. I can yet picture to myself the first time I ever saw the starlings flocking homeward in the evening shadows—the last spears of sunlight flashing over the frosty fields, the west all aglow with wondrous shades of rainbow hues, the tall pines standing grim and gloomy against the sunset sky, and overhead from all sides the starlings coming in with arrowy flight.

The up and down course, and the harsh call of the Jay—*Garrulus glandarius* (Linnæus) -are familiar to the dweller among the pleasant woodlands and leafy groves of Norfolk and Suffolk. But year by year its scream is becoming less frequent, and its nest less common in the plantations, for the Jay is one of the birds in whose slaughter the keeper's soul delights. The Magpie—*Pica rustica* (Scopoli)—too, is becoming scarcer annually. Till 1882 or 1883 Magpies always built at

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Wherstead, but they were shot down, and now it is uncommon to hear of a nest of magpies ever being reared at all, save in those few places where game is not preserved strictly. Common in every church tower, in many chalk pits, indeed in all sorts of odd places, is the Jackdaw—*Corvus monedula*, Linnæus; but the Carrion Crow—*Corvus corone*, Linnæus—has almost disappeared. Till eight years ago I saw, and sometimes shot, Carrion Crows every year, but now it must indeed be marked as *rara avis*. They do still breed, it is true, but only where the gamekeeper does not come, and soon the dismal croak of the crow will be a thing of the memory only in Suffolk. With the October frosts come numbers of the Hooded Crow—*C. cornix*, Linnæus—which, according to Yarrell, is but a variety of the last-named bird. (Newton's Yarrell's, "Br. B.," ii., 274.) The Rook—*C. frugilegus*, Linnæus—abounds everywhere, but the Raven—*C. corax*, Linnæus—is gone, and is now only heard of in the counties as a rare and accidental straggler.

The Skylark—*Alauda arvensis*, Linnæus—frequents our fields in large flocks in winter, and Sheppard and Whitear consider that they come to us from the continent. (Stev., "B. of N.," i., 177.) The only record I have of the Woodlark—*Alauda arborea*, Linnæus—is of one shot by my brother with a catapult in a sheep yard at Wherstead, in the winter of 1887. This bird does not seem to be anywhere common in East Anglia, for Suffolk, indeed, Babington records comparatively very few notes. The latest of our spring migrants, the Swift—*Cypselus apus* (Linnæus)—is always to be seen throughout the summer days, and far into the evening dusk too. As a rule this bird leaves England very early in the autumn, and only twice have I noticed it later than the first day or two in September, and very rarely as late even as that. The two occasions I referred to were Sept. 7, 1886, while shooting at Little Blakenham, and Sept. 11, 1889, at Bramford.

The curious "churring" note of the Nightjar—*Caprimulgus europæus*, Linnæus—is an oft heard sound on the gorse-clad heaths, and by the long sandy plantations where the firs grow on the eastern coast. The bird is not absolutely common anywhere, but in all the districts in which I have looked for it, it has been always to be found. I have several times obtained the eggs, once getting a pair of a curious greenish variety. Often too, while wading knee-deep through fern, or stooping under the fir trees in the woods, I have walked almost on to the bird, or seen it sitting along some low fir branch. The Greater Spotted Woodpecker—*Dendrocopus major* (Linnæus)—is occasionally seen, but of the Lesser—*D. minor* (Linnæus)—I have only one note that I can vouch for. In December, 1882, in a small wood at Wherstead, one of these birds alighted on one end of a fallen tree trunk, not more than five or six yards from my father, who was seated on the tree. It remained several minutes, my father sitting absolutely still. The Green Woodpecker—*Gecinus viridis* (Linnæus)—is well distributed over the country, and everyone knows its laughing cry. It nests with us, but I have not been fortunate enough to take the eggs myself. The Wryneck—*Iynx*

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torquilla, Linnæus—is said by Babington and Stevenson to be common in the counties, but in some parts of Suffolk, at any rate, the bird is rarely heard, and still more rarely seen. It passes in East Anglia by the names of "Cuckoo's Mate" and "Barley Bird." Next in my list is that living jewel, the Kingfisher—*Alcedo ispida*, Linnæus—which is not really abundant anywhere. It is often shot by the would-be sportsman to form a hideous object in a glass case, to "adorn" a sitting-room, when it looks as unlike its own bright beautiful self as possible. The bird is perhaps migratory in a minor degree. We certainly every winter see Kingfishers in many streams, where none are in summer. (*Vide* "Zoologist," 766, and 2nd S. 3799.) Mr. Stevenson is of opinion ("B. of Norf.," 299, 300) that the Hoopoe—*Upupa epops*, Linnæus—would breed in Norfolk and Suffolk if it were allowed, but of course the appearance of so striking a visitor draws down on itself every gun in the neighbourhood. The Cuckoo—*Cuculus canorus*, Linnæus—is a regular summer visitant to us, but its numbers vary greatly in different years. I have found its eggs in the nests of Wagtail, Robin, Blackcap, Hedge-sparrow, Whitethroat, and Wren. A curious case of mistaken instinct in this bird came under my notice some years ago. A robin had built in a stump of an old fence. The nest was accidentally overturned and the eggs broken. The nest was however replaced by a lady, and a week later the egg of a cuckoo was found in it. The egg is still in my possession. Few old cuckoos remain with us after early August, but at Beckenham Parva I saw a young bird on Sept. 2, 1891. It haunted the place for a full week longer, and then disappeared. Reaching the owls we may mark the Barn Owl—*Strix flammea*, Linnæus—as still common, but no other owl is now very frequent in East Anglia. I have one note of the breeding of the Long-eared Owl—*Asio otus* (Linnæus)—in 1885. The birds had used an old crow's nest to lay their eggs in, but the keeper found them out and shot both the old birds and destroyed the eggs. This was at Club's Heath Wood, Belstead. I saw both birds and broken eggs. The Short-eared Owl—*Asio brachyotus* (Forster)—I have several times flushed from turnips or even a stubble while shooting in October. It is often called the Woodcock Owl with us, from its appearance about the same time as the Woodcock. In 1881 it was extraordinarily abundant round Sudbury. The keepers ruthlessly kill every owl they can, and among the ghastly trophies of the "keeper's museum" many a dead harmless barn owl may be seen, and mingled with them the dried bodies of the Tawny or Wood Owl—*Syrnium aluco* (Linnæus) The latter is now in some places uncommon, and its curious weird hoot is heard no longer in the dark glades of the oak woods. I observed two nests of the Tawny Owl last year—the young of both, I am glad to say, were hatched and flew in peace. Rare, too, are the Harriers. As lately as 1885-7, on many a glorious summer's day have I seen the Hen-Harrier—*Circus cyaneus* (Linnæus)—beating up and down the salt marshes that lie beside the Deben at Falkenham, while overhead the white clouds raced across the blue vault of heaven, and the air blew

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keen and salt from the sea. But now the Harriers have almost disappeared. None of them were ever so frequent inland as near the coast, and in the west of Suffolk they are now almost non-existent. Professor Newton stated that Montagu's Harrier—*Circus cinereaceus* (Montagu)—was the least rare in the Eastern counties, but is it not possible that the Hen Harrier has been, at least in some instances, mistaken for it, as the two seem to be somewhat similar in appearance at some periods. (*Vide* Stev., "B. of Norf.," i., 39.) Certain it is that now Montagu's Harrier is the rarest of the three, whatever may have been the case when Newton wrote. As rare as the Harriers are the Buzzards. From 1880 to 1887 the Wherstead woods were occasionally visited by one or other of them, but the wary birds kept at too great a distance for any attempt at recognition of species. In the winter of 1887, however, a fine female specimen of the Rough-legged Buzzard—*Archibuteo lagopus* (Gmelin)—was shewn to me in the flesh. This specimen had been procured at Belstead. Last year I heard that a Buzzard had been trapped at Nettlestead, but as I did not see the specimen I cannot say what species it was. One day in December, 1887, a Buzzard passed over me within thirty yards but I had no gun.

That daring freebooter, the Sparrow Hawk—*Accipiter nisus* (Linnæus)—even in my remembrance is far less abundant than it was. It is rarely to be met with now, but a few years ago it was fairly common in our woodland districts. This is a bold and rapacious hawk—I have seen it pursuing an old partridge in September directly in front of a line of guns, and again I once saw one dash under a waggon, which was being loaded with straw, in pursuit of a greenfinch. While living a few miles from Ipswich by the Orwell, I noticed the Merlin—*Falco æsalon* (Tunstall)—on three or four occasions, once lying in a ditch for half an hour watching a pair of these birds through field glasses at about ninety yards distance. I was not successful in an attempt to crawl nearer. This was in August, 1888. According to Babington ("B. of Suff.," p. 28), this bird is most frequent in Suffolk in the autumn and winter, but it is now rare at any season. Undoubtedly our commonest hawk, in fact the only hawk that can be said to be common at all, is the Kestrel—*Tinnunculus alaudarius* (Gmelin). In most parts of the district it is still very frequently met with. In one small parish I have seen half a dozen kestrels within an hour or so, in this case the reason being that the birds bred in chalk-pits near by, where they were rarely disturbed. In the breeding season the kestrel will sometimes attack young game. This year a farmer shewed me four young English partridges that he had just seen a pair of these hawks kill, and he pointed the birds out to me soaring round and round one another far overhead, mere specks in the intense blue. In a chalk pit hard by, kestrels have built in a hole on the north side for a period beyond the memory of living man. A curious note I have from my father relative to this bird tells how, many years ago, he saw a kestrel pursued by two or three carrion crows in Bramford Park. One of the crows, rising above the hawk, suddenly

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struck at it and killed it on the spot. I have often seen the kestrel mobbed by crowds of small birds, noticeably those of the martin tribe, but he rarely seemed to take any notice of them.

The Heron—*Ardea cinerea* (Linnæus)—yet lingers in its ancient heronries by the sides of slow moving streams in East Anglia, and its harsh croaking cry is well-known to all who have watched amid the low-land mists as the shadows of night closed over the land. Stevenson mentions the heron having been seen at sea thirty miles from Yarmouth ("B. of Norf.," ii., 144). The draining of the Fens is responsible for the rarity of the Bittern—*Botaurus stellaris* (Linnæus)—as it is for many another bird, many a flower and insect. It is recorded as rare at Bramford, in Babington's "Birds of Suffolk," p. 161, but it might now be regarded as extinct in that district. This also may be said of most parts of Norfolk and Suffolk now, but eighty years ago it bred in fair abundance in both counties. The latest record of a nest in Norfolk is in 1868 (Stev., "B. of Norf.," ii., 160–8). The boom of the Bittern in the spring will never again be heard over the wild waste of water and reeds till the much talked of New Zealander shall stand on London Bridge to survey the ruins of St. Paul's. The single note I have of the White Stork—*Ciconia alba* (Bechstein)—is one of a bird still in my father's possession. It is a female and was killed at Drimley in the spring of 1860, by a Mr. Cobbold, I believe.

In the winter of 1890-91 many small flocks of geese haunted the meadows near the Gipping and the fields lying round, and nightly their clanging call echoed through the frosty air over the ice-bound and snow-clad land, but though several were shot I was unable to obtain a view of a specimen. I think it likely, however, that they were either the Grey Lag—*Anser cinereus* (Meyer)—or the Bean Goose—*A. segetum* (Gmelin) —probably the latter, as that bird is now our commonest goose. Many years ago a man named Gostling was driving the tame geese at Little Blakenham Hall out on to the meadows one foggy morning, when a female Grey Lag Goose, attracted by their calling, swept down and joined them. The man drove all the geese with the wild one back into a closed in court and secured the Grey Lag. She was in our possession for many years, and bred regularly with the tame birds. I can well remember her about 1878 or 1879. She was presumably shot, as she flew away one evening according to her usual custom, and did not return. The last of the cross-bred birds was sold about 1880. A small number of geese passed low over me one Sunday evening in early January this year, but it was too dark to distinguish anything about them, save the fact that they were geese. With that exception I saw no geese this year where last year I might always expect to find at least a few. The Wild Swan—*Cygnus musicus*, Bechstein—I have myself only seen once, viz., in 1881, when I noticed seven in the Orwell off Shotley. Last year, during the sharp weather, many were shot in various places in East Anglia, but as a rule we do not see much of the swans except during a severe winter.

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Several ducks are recorded by my father in Babington's "B. of Suff." as being found more or less in Bramford and the surrounding district. Probably of most of these it may now be said that they never, or very rarely indeed, visit the locality. I have seen the Wigeon—*Mareca penelope* (Linnæus)—several times on the Gipping, and it still returns every winter in fair numbers to its old haunts, but in a few years this bird will be quite extinct in many spots where it used to be a regular visitant. The only duck really common throughout the length and breadth of East Anglia is *Anas boscas* (Linnæus)—the Wild Duck, *par excellence*. Even its numbers are rapidly thinning. It breeds in most places where there are suitable spots, and sometimes nests a long way from water. An old man told me that some eight years ago he met a duck with eleven young, at four o'clock one summer morning, proceeding down the Hall drive at Bramford towards the Gipping, which was half a mile or more away. He secured all the young, but the old duck, of course, flew away. Years ago the Teal—*Querquedula crecca* (Linnæus)—was always to be found on every decoy pond and almost on all waters, but now, unless you go to the larger pools, you may not see ten teal all the season. They occasionally visit the Gipping and similar streams, but so far as my experience goes not in any numbers. The Tufted Duck—*Fuligula cristata* (Leach)—is to be seen every winter on streams and open waters, and may even be sometimes flushed from quite small ponds. It, too, is perceptibly rarer of late years. The Scaup Duck—*F. marila* (Linnæus)—is frequent along the coast in winter, and may occasionally be met with inland. One lit on a flooded meadow at Blakenham, in December, 1889, and remained on the water all day, taking flight at evening. Fewer Pochards—*Fuligula ferina* (Linnæus)—come to our waters now than formerly, though they breed, I believe, abundantly in some parts of West Norfolk. On Dec. 26, last year, one was shot at Bramford, within a very short distance of a paper mill and some bone manure works on the Gipping. In the Columbæ three birds are always to be met with in Eastern England, *i.e.*, *Columba palumbus*, Linnæus—the Ring Dove; *C. œnas*, Linnæus—the Stock Dove; and *Turtur communis*, Selby—the Turtle Dove. The Wood Pigeon or Ring Dove may be heard all the summer through in our woods and plantations, but it is not till the winter that they occur in vast numbers. In December, 1888, thousands came to the oak woods in Suffolk—147 falling to my gun in a very few days. There was a slight fall of snow on the ground, and they came for the purpose of feeding on the acorns. From the crop of one bird I took thirty-six acorns; from another 197 holly-berries. The Stock Dove breeds in nearly every district in hollow arms of trees, holes of chalk-pits, &c. At Thelford, on the warrens, it breeds in rabbit holes under thick furze bushes, and the warreners train dogs, called by them "dow dorgs," to find the young birds. (Stev., "B. of Norf.," i., 356-7). I have not noted the scarcity of Stock Doves in the late autumn and winter spoken of by Babington ("B. of Suff.," p. 105), for I have frequently seen flocks of some hundreds on the young clover

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in December and January, though they do not seem to remain long in one locality, Both this bird and the Ring Dove often repair to the walls of the chalk-pits in summer, apparently for the chalk, their crops often containing little or nothing except chalk. The Turtle Dove is very plentiful with us in the breeding season. The earliest note I have of its appearance is April 26, 1891, and the latest, September 21, 1889, both at Little Blakenham. On a drowsy afternoon in summer the low crooning "coo" of the Turtle Dove harmonises with the hum of insects and the gentle stir of the breeze among the boughs, and does not break the lazy stillness but seems to be a part of it, a part, too, without which it would not be complete. Pied and white varieties of the Pheasant—*Phasianus colchicus* (Linnæus)—are not rare in our woods. The old form of Pheasant with no white ring round the neck is now rarely met with, so far as I have seen. The Red-Legged Partridge—*Caccabis rufa* (Linnæus)—and the English Partridge—*Perdix cinerea* (Latham)—naturally swarm in game counties like Norfolk and Suffolk. In some parishes one species predominates, and *vice versa*. Many people yet think the "French" bird interferes with the other, but I do not believe there is any ground for the assertion. *C. rufa* often nests in curious places,—on straw stacks for instance. In 1890 a pair of birds of this species at Little Blakenham brought up a brood on a bank fifteen yards long lying between the mouths of two lime kilns in constant use. My father, Captain Haward, informs me that many years ago, when returning from a day's partridge driving, he shot at what he imagined to be a wood pigeon on the top of a dead elm of considerable height. The bird fell dead, and proved to be a "French" partridge. I have myself taken the bird uninjured in the mouth of a rat's hole when the covey had been fired at, and I have also picked these birds up from a fence without a shot mark on them when out partridge shooting. I weighed a cock specimen of *C. rufa* in, I think, 1888, at Wherstead, which scaled 21½oz., which is considerably above the usual weight of this bird. In 1890, the Rev. F. B. Zincke, Vicar of Wherstead, sent me a note of three white specimens of this species that had occurred in the autumn months of the preceding year in his parish. The Quail—*Coturnix communis*, Bonnaterre—has now become so rare, that in parishes where its curious call was once a familiar feature, it is now no longer heard, and I have not seen even one specimen of it in the flesh.

Reaching the Rails, the Water-Rail—*Rallus aquaticus*, Linnæus—is a frequently overlooked bird. In reality it is far from uncommon. It is, doubtless, partially migratory, for during the summer months nothing like the number of rails are to be met with that may be found in the ditches in winter. Stevenson ("B. of Norf." ii., 404) regards it as migratory as well as resident, and Mr. J. H. Gurney (*in litt.*) goes so far as to say that none of the birds which nest in Norfolk remain for the winter. Nine times out of ten you will pass this bird, unless you come unexpectedly upon it feeding in some open spot, and even then it will run along under the bank, if possible, rather than rise. A much rarer

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bird is the Spotted Crake—*Porzana maruetta* (Leach). I have met with it once only. While living at Pannington Hall, Wherstead, in 1880, I noticed one spring day a bird running round the edge of a pond close to the house. Informing my father of it, he shot the bird, which turned out to be a Spotted Crake, whose wing had been wounded by a previous shot, but had healed in a manner. The Corn Crake—*Crex pratensis*, Bechstein—does not appear to be equally distributed over the district. In some parishes it is rarely or never heard, while in others its call is one of the well-known signs of the summer. On Sept. 18, 1889, a Clumber spaniel with me, seeking a wounded French partridge, flushed a landrail some 150 yards from me. It flew directly towards where I stood, but altered its course when it came within about 40 yards, and as it turned it distinctly called twice. I shot it, so I am positive I made no mistake as to its species. I do not know if the calling of this bird on the wing is an unusual occurrence, but I have never noticed it before. The Landrail must sometimes remain here during the winter, as my father informs me that he shot one either on December 24 or 26, 1847, on some meadows at Bramford. The Moor-hen—*Gallinula chloropus* (Linnæus)—is very abundant in all our streams and meres. In "Zoologist," 2167 (also see "Norf. and Norw. Nat. Trans.," iii., 581) a curious variety shot by my father is mentioned, which had all the webs of the feathers disunited, giving it the appearance of being covered with hair. It was killed at Bramford on Dec. 16, 1847. (Morris, "Br. B.," p. 68, vol. v.) The Coot—*Fulica atra* (Linnæus)—is not often seen except on broads and meres, but I shot one on Dec. 27, 1891, out of a pair seen on the Gipping, close to the paper mill at Bramford.

Often in the cold clear nights of autumn and winter the whistle of the Golden Plover—*Charadrius pluvialis*, Linnæus—comes clear through the keen air as the birds pass overhead in the bright star-light, but in summer we hardly ever meet with it. It does not breed in East Anglia. (Stev., "B. of Norf." ii. 69; Babington's "B. of Suff.," p. 118), but it has been met with in the counties in nearly every month of the year. In winter large flocks appear on the great fields inland, but go southward when the ground is hardened by the frost. The Lapwing—*Vanellus vulgaris* (Bechstein)—too, comes in the cold weather in vast numbers, often frequenting year by year the same fields, as also does the Golden Plover. Babington ("B. of Suff.," p. 119) states that the Lapwing only lays its eggs on heaths and commons, in which I think he is in error, as I have annually found a few nests at Little Blakenham, on land belonging to the Hall, and in other parishes on cultivated land. In March, 1887, at Wherstead, a large flock of these birds and Golden Plover alit on a ploughed field, and were so tired with their flight that they allowed persons to walk up to them till they were almost within reaching distance. They were not molested and pursued their flight northward after a few hours' rest. The Woodcock—*Scolopax rusticula* (Linnæus)—occurs throughout the district both as an autumnal emigrant and as a resident, though in small numbers only as regards the latter.

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In 1884 I had a hen bird brought me which had been found dead on her eggs in Holbrook Park, which is one of the breeding places of the Woodcock. This last season Woodcock were scarce with us, but in 1890 they were present in large numbers. This remark will also apply to the Common Snipe—*Gallinago cœlestis* (J. S. T. Frenzel)—which was very scarce this season in the district I shot over. The snipe still breeds with us, but the number of home-bred birds diminishes year by year, as the fens and marshes are drained, and corn and meadow land takes their place. The Jack Snipe—*Limnocryptes gallinula* (Linnæus)—is less abundant in most places than its larger relative. I have, however, on occasions, fallen in with large numbers of them. One such occasion I remember on low meadows by the Gipping. I had walked all the afternoon, and had not seen a single Jack, though I had several full snipe in my pockets. As the western sky crimsoned with the last beams of the dying sun I turned homewards, and crossed a small marshy meadow which I had not thought it worth while to examine previously. Jacks rose around me in all directions, but the fading light was then so poor that I only secured two or three. Returning the following morning in the gray of the early winter dawn I could not find one snipe on the land where the night before nearly every footstep had flushed one. The Dunlin—*Tringa alpina*, Linnæus—is one of our commonest shore birds after the breeding season, and I have met with it at considerable distances inland. Stevenson remarks on the variation in plumage exhibited by the Dunlin ("B. of Norf.," ii., 380). Great numbers of these birds come into the markets under the name of "ox-birds." The Common Sandpiper—*Tringoides hypoleucus* (Linnæus)—is a summer migrant on our shores, rarely found far inland. The Green Sandpiper—*Helodromas ochropus* (Linnæus)—frequents our shores and streams not uncommonly, chiefly in the winter months. The last time I saw any specimens of this bird was during the last weeks of 1891 and in January 1892. Two pairs haunted the railway ditch at Bramford and Blakenham during that time, and the men at work on the line, who drew my attention to them, informed me they had been about for some weeks previously. Some years ago I had many eggs of the Redshank—*Totanus calidris* (Linnæus)—from Falkenham, but I am told it breeds there now in fewer numbers than formerly. It is always to be found along the sea coast, more rarely inland. I have also many notes of the Greenshank—*T. canescens* (Gmelin)—which is another coast bird, but it is questionable if it ever breeds with us. I have not had the opportunity of observing many of those birds, which are nevertheless abundant, but the Whimbrel—*Numenius phæopus* (Linnæus)—and the Curlew—*Numenius arquata* (Linnæus)—I have seen on many occasions. Neither of these birds breeds in the Eastern counties. ("Stev., "B. of Norf.," ii., 195; Bab., "B. of Suff.," 152, 153.)

Of the order Gaviæ I have little to record. I have seen specimens of the Arctic Tern—*Sterna macrura* (Naumann)—and the Common Tern—*S. fluviatilis* (Naumann)—from Felixstowe and other places along the

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coast. Other Terns, also, are to be found along the length of the sea-shore, but I have no personal notes of them. The Kittiwake—*Rissa tridactyla* (Linnæus)—is fairly common, and the Common Gull—*Larus canus*, Linnæus—is very abundant. I have often met with large flocks of this bird on inland waters in stormy weather. I have only shot the Greater Black-backed Gull—*Larus marinus*, Linnæus—once, *i.e.*, at Wherstead in 1887, this bird being very rarely seen far from the sea. A beautifully marked specimen of that variety of the Black-headed Gull—*Larus ridibundus*, Linnæus—formerly called the Masked Gull—*L. capistratus* (Temminck)—is in our possession. It was killed at Aldeburgh, April, 1848 ("Zoo.," 2231, and Morris' "Br. B.," p. 127, vol. vi.). The ordinary form is an abundant bird both by the sea and inland all through the year.

No Grebe is very frequently met with, except on the Broads, but in the winter considerable numbers of the Little Grebe, or Dabchick—*Tachybaptes fluviatilis* (Tunstall)—come to the river Gipping and similar streams. It may be seen at Bramford unconcernedly diving and swimming up and down within a few yards of the large factories there. This bird is always abundant on the open waters in East Anglia.

With the Dabchick end my notes on Norfolk and Suffolk birds, poor and few in number, but which may contain a few facts worthy of being recorded, and in that hope I have read them to you to-night, trusting you will pardon any imperfections, many of which are sure to arise in a paper such as this, compiled from various notes taken in a rough and ready manner at different times.

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Quarterly Reports of the Sections.

SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

One meeting only has been held since the last report. On April 12th the Rev. J. E. STOCKS, M.A., read a paper on "The Roll of Bishop Hugh of Wells (1209-1235) for the Archdeaconry of Leicester." (Printed on page 525.)

J. M. GIMSON, *Chairman.*

SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY.)

March 23rd.—Present nine gentlemen, four ladies.

Exhibition of Silks.—Mr. HEADLEY exhibited the cocoons and the silk from the common Silkworm (*Bombyx mori*), and from the large South American *Bombyx imperialis*, and said that nearly all the *Bombyces* produced silk varying in quality from each species.

Periodicals.—Mr. MOTT (in the chair) announced that the circulation of periodicals would be discontinued, as the Council of the Society was unable, in consequence of the cost of furnishing the new room, to make any grant for that purpose. The Council would, however, pay all claims already incurred, and also the cost of the new Diagram Frame, viz., 30s.

Paper, on "Stings and Poison Fangs," by Mr. F. T. MOTT, F.R.G.S. It was pointed out that among plants true stings were only found in about twenty genera; and in animals only among the Hymenopterous insects

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and the Scorpion; and that poison-fangs were confined to Snakes, Spiders and Centipedes. The different species were described, and reference made to the irritating qualities of gnats, fleas, jelly-fish, &c., which were not due to true stings. The rapidity of the action of the poison injected by stings and fangs was very remarkable, and not at present accounted for. (This Paper is printed in the Transactions, p. 534.)

In the discussion that followed, Mr. E. F. COOPER believed that the darts of the Hydra carried a poison. Mr. BOUSKELL said the hairs on the caterpillars of the Golden-tail Moth were cast off and floated about, and often caused irritation of the skin when the caterpillar had not been touched.

Mr. S. F. BURFORD stated that in examining solutions of silicate of alumina he had found under the microscope circular disks which appeared to be organisms.

April 20th.—Present eight gentlemen, three ladies.

Exhibition of Fresh Water Shells.—Mr. MOTT exhibited a small collection of Bivalves and Univalves, all found in Leicestershire, and pointed out the peculiarities of some species to the new Members of the Section.

New Records.—Mr. HEADLEY announced that he and Mr. BOUSKELL had recently added four new species to their list of the County Lepidoptera, viz.:

The Red Sword-grass Moth		(*Colocampa vetusta*).
The Powdered Quaker	„	(*Tæniocampa gracilis*).
The Red Chestnut	„	(*Tæniocampa rubricosa*).
The Early Grey Moth		(*Hylocampa lithorhiza*).

Mr. W. A. VICE announced that he had found three plants in District 9, not recorded in the Flora, viz.: *Anemone nemerosa, and Mercurialis perennis* near Enderby; and *Paris quadrifolia* in Narborough Bog. He said he had occasionally seen the Hawfinch at Blaby.

Paper, on "The Leicestershire Pond Weeds (*Potamogetons*)," by Mr. E. F. COOPER, F.L.S. Mr. COOPER having discovered in the Canal, near Loughborough, a form of *Potamogeton* new to science, had been led to the study of this difficult genus, and gave to the Section a very interesting description of the species known in this county, illustrated by admirably mounted specimens.

May 18th.—Present ten gentlemen, seven ladies.

Officers.—Rev. T. A. PRESTON was re-elected Chairman, and Mr. KNOWLES Secretary.

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Excursion.—Mr. MOTT reported that nine Members visited Bradgate Park last week, but the cold dry season had kept everything very backward and nothing of interest had been found. The party were very handsomely entertained by the Chairman at Thurcaston Rectory, and found much interest among the herbaceous plants in his garden.

New Records.—The CHAIRMAN announced the finding of *Bromus erectus*, a grass rare in this county, at Cropstone.

Paper.—"A Study of the Order Ranunculaceæ," by Mr. F. T. MOTT, F.R.G.S. The four great divisions of the Order were pointed out, and the distinguishing characters of each genus. Objection was taken to this Order being placed at the head of the Vegetable Kingdom as if it were the most typical of the completest vegetable life; whereas one of the great systems of structure, the woody system, representing the skeleton among animals, was almost entirely absent from the order. (This Paper will be printed in the Transactions).

In the discussion, the Chairman pointed out the great feature which distinguished the *Ranunculaceæ* from the *Rosaceæ*, viz.: that in the former the stamens are hypogynous, while in the latter they are perigynous. He observed also that while nearly all the *Ranunculaceæ* were acrid and dangerous, all the *Rosaceæ* were mild and innocuous.

Mr. BURFORD suggested that in the classification of plants the various active principles, alkaloids, &c., which they contained, should be taken into account, as these were very characteristic of definite groups.

T. A. PRESTON, *Chairman.*

SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

March 14th.—The Vice-Chairman, Dr. F. M. POPE, read a Paper on "The Hind-limb of Vertebrates."

In the course of his remarks he spoke of the interest arising from a comparison of homologous parts of the body in different animals, and said that the present Paper formed a sequel to the one read by him before the Section more than two years previously, on the Fore-limb of Vertebrates.

After some further introductory observations on the development of limbs in general, Dr. POPE proceeded to describe the various modifications of the Hind-limb in the different divisions of the Vertebrata. The

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pelvis, he pointed out, was really developed in correspondence with the limb, its structure being very complicated in some forms, whilst in others —as the Sirenia, amongst the Mammalia, where hind limbs are absent, it existed only in a very rudimentary condition.

A detailed description was given of all the chief types, examples of many of them being shown. The paper was also illustrated by black-board sketches, and formed a most valuable *resumé* of the present state of knowledge on the structure and affinities of the hind limb.

A vote of thanks to the Lecturer, proposed by the CHAIRMAN, and seconded by Mr. W. A. VICE, was carried unanimously.

A discussion took place on the action of the Council with reference to the grants for the purchase of periodicals. It was felt that their decision to vote no sums of money to the Sections this year for such a purpose was a somewhat unfortunate one, having regard to the success which had attended the circulation of magazines amongst the members, and that an effort should be made to obtain a reduced grant which might be supplemented from the funds of the Section.

On the proposition of Dr. POPE, seconded by Mr. VICE, it was resolved to memorialize the Council to grant a sum of £2, the Section itself finding an additional £2.

It was suggested that "Nature," "Natural Science," "The Ibis," "The Geological Magazine," and "The Entomologists' Monthly Magazine," should be obtained for circulation.

The CHAIRMAN suggested that an effort should be made to secure the permanent representation of the Section on the Council, and, after some discussion, Dr. POPE moved the following resolution :—"That it appears to this Section desirable that each Section should be represented on the Council by its Chairman for the time being, if he be not already a member of the Council." Mr. W. A. VICE seconded the resolution, which was carried unanimously.

April 11th.—The SECRETARY stated that he had acquainted the Hon. Corresponding Secretary of the Society with the resolutions passed at the previous meeting respecting the grant for magazines, and also the question of the representation of the Sections on the Council, and read two letters received from Mr. GIMSON, by which it appeared that the Council granted a sum of £2 for the purchase of magazines, on the understanding that a like sum was raised by the Section; and, further, that the question of representation should be considered at the Annual Meeting of the Society to be held in June.

The following were elected Associates of the Section :—Miss E. N. PATEY, of Newtown Street, proposed by the CHAIRMAN, and seconded by

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Mr. W. A. Evans; Mr. L. Creaghe-Haward, of Mill Hill House, proposed by the Chairman, and seconded by Dr. Macaulay.

The Chairman proposed an alteration in the hour of meeting, suggesting that in future it should be at 8 p.m. instead of 7.30. After some discussion this arrangement was adopted.

A Paper entitled "Notes on some East Anglian Birds" was read by Mr. L. Creaghe-Haward. (Printed at page 538.)

The Chairman, Vice-Chairman, Dr. Macaulay, and Messrs. Evans and Pycraft, took part in the discussion which followed, after which a vote of thanks was passed to Mr. Creaghe-Haward.

The Chairman reported the arrival of the Willow Warbler on March 5th, and Dr. Macaulay handed in the following dates of arrival of Summer Migrants observed by him:—Chiffchaff, March 30th; Garden Warbler, April 10th; Tree Pipit, April 10th; Swallow, April 11th.

May 9th.—The Annual Report and Balance Sheet were read by the Secretary, and adopted.

The Rev. R W. Lancaster, M.A., was elected Chairman for the ensuing year, on the proposition of Mr. Montagu Browne, seconded by Mr. E. Pattison, and Mr. F. R. Rowley was re-elected Secretary, on the proposition of the Rev. R. W. Lancaster, seconded by Mr. E. Pattison.

The Chairman, Mr. Montagu Browne, read some notes received from Mr. S. R. Pattison, F.G.S., of London, descriptive of some fossils from the Purbeck "dirt bed," and Portland Oolite, recently presented by him to the Museum. These comprised a fine example of the basal part of the stem of a Cycad *(Mantellia)*, a portion of the trunk of a Conifer *(Araucaria)*, and an exceptionally interesting specimen of a Coral *(Isastrea oblonga)*, encrusting shells of a boring Mollusc (probably *Lithodomus.)* Mr. Pattison described the conditions prevailing during the deposition of the Purbeck and Portland Beds, calling special attention to the interesting "dirt bed" which formed the old land surface on which flourished the vegetation of the period, whilst it was shown how the presence of beds containing marine fossils interstratified amongst the terrestrial and estuarine deposits pointed to periods of alternate depression and elevation, with corresponding inroads of the sea. A brief description was also given of the chief features of the *Cycadeæ*, and their distribution at the present day.

The Chairman, Mr. Montagu Browne, then read a Paper entitled "Notes upon the Mesozoic Fossil Fish, *Ceratodus*, and its living representative, *Epiceratodus (Ceratodus) Forsteri* (Teller), with exhibition of palatal and mandibular teeth, from the Rhætics of Aust Cliff,

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Gloucestershire, and Spinney Hills, Leicestershire," which will be embodied in a forthcoming memoir. After alluding to the appearance and habits of the still existing *Ceratodus*, Mr. BROWNE proceeded to describe the discovery of the fossil remains of this fish in the Rhætic beds. By the aid of a capital diagram he showed the characteristic features, and the position in the jaws of the curious teeth, of which he exhibited a very fine series, mostly collected by himself.

At the conclusion of the Paper, a vote of thanks, proposed by Mr. E. PATTISON, and seconded by the Rev. R. W. LANCASTER, was carried unanimously.

MONTAGU BROWNE, *Chairman.*

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Announcements.

SECTIONAL MEETINGS.

SECTION "A."

Chairman—Mr. C. J. Billson, M.A., St. John's Lodge, Clarendon Park Road.

Secretary—Mr. F. S. Herne, Permanent Library.

The Section meets on the second Tuesday in each month during the Session.

C. J. BILLSON, *Chairman.*

SECTION "D."

Chairman—Rev. T. A. Preston, M.A., Thurcaston Rectory, Leicester.

Secretary—Mr. J. J. W. Knowles, 25, St. Stephen's Road, Highfields, Leicester.

Excursions.—The second Wednesday in each Summer month, at about 3 p.m.

Evening Meetings—The third Wednesday in each month, at the Museum, at 7 p.m.

1892.

July 13.—Excursion to Brazil Wood.

,, 20.—1. Exhibition of Birds' Eggs.

2. Paper. "On the Formation of Bogs."

August.—No Meeting.

September 14.—Excursion to Nailstone Wiggs.

,, 21.—1. Exhibition of Plants and Flowers of the Order Compositæ.

2. Paper.

T. A. PRESTON, *Chairman.*

SECTION "E."

Chairman—Rev. R. W. Lancaster, M.A., Beaumont Villas, Aylestone Road.

Vice-Chairman—Montagu Browne, F.G.S., F.Z.S., Town Museum.

Secretary—Mr. F. R. Rowley, Town Museum.

EVENING MEETINGS.

July 18.—Paper by Mr. G. H. Storer, "Impressions of Dorset: Its Natural History and Geology." (Illustrated.)

August.—No Meeting.

Sept. 12.—Notes and Exhibits.

R. W. LANCASTER, *Chairman.*

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ANNUAL REPORTS

OF THE

LEICESTER

Literary & Philosophical Society.

FIFTY-FIFTH SESSION,

1889—90.

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REV. A. P. DAWSON, M.A.
F. T. MOTT, F.R.G.S.
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C. J. BOND, F.R.C.S.	W. A. VICE, M.B.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1890-91.

President:

F. T. MOTT, Esq., F.R.G.S.

Vice-Presidents:

THOMAS CARTER, LL.B.
E. F. COOPER, F.L.S.
J. D. PAUL, F.G.S.
GEORGE STEVENSON.

Council:

Retiring June, 1891.	Retiring June, 1892.
H. BILLSON.	C. J. BOND, F.R.C.S.
A. T. DRAPER.	C. W. COOPER, M.B.
J. E. M. FINCH, M.D.	HERBERT ELLIS.
G. B. FRANKLIN.	REV. P. T. FORSYTH, M.A.
J. M. GIMSON.	R. HARVEY, LL.B.
W. JACKSON.	W. KEMPSON.
A. P. MOORE, M.A.	J. J. W. KNOWLES.
C. A. MOORE, M.D.	T. C. LEE.
A. H. PAGET.	M. L. LEWIS, M.A., LL.M.
JAMES PLANT, F.G.S.	F. M. POPE, M.B.
HENRY TOMKINS, M.D.	REV. T. A. PRESTON.
W. A. VICE, M.B.	REV. J. WENT, M.A.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:

Under the old Deed of Transfer from the Society.

THOSE ONLY ARE QUALIFIED TO ACT WHO REMAIN MEMBERS OF THE SOCIETY.

A. PAGET. | S. S. BANKART.

TOWN COUNCIL COMMITTEE:—

Ten Members of the Council.

ALD. KEMPSON, CHAIRMAN.
H. LANCASTER, MAYOR.
Ex-Officio.
ALD. ALMOND.
ALD. ANDERSON.
ALD. BENNETT.
MR. BURGESS.
MR. COLLIN.
MR. ELSE.
MR. FRANKLIN.
MR. MOTT.
ALD. PAGET.

Six Gentlemen not Members of the Council.

C. BAKER.
H. BILLSON.
E. F. COOPER, F.L.S.
A. H. PAGET.
J. D. PAUL, F.C.S.
A. RUST.

HONORARY CURATORS:—

ALD. KEMPSON.
J. D. PAUL, F.G.S.
ALD. PAGET.
A. H. PAGET.
H. BILLSON.
A. RUST.

CURATOR:—

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Addenly, Alfred 1873
Allen, Charles Gordon 1886
Almond Thomas 1870
Aspell, William Laxton ... 1889
Atkins, Arthur Frederick ... 1878
Atkins, Rev. Edward, B.Sc. ... 1876
Baines, Alexander 1874
Baines, William... ... ...
Baker, Charles 1861
Barfoot, William 1874
Barlow, Arthur Edward, M.D... 1888
Bates, Ernest Frederick ... 1889
Bates, William Henry 1862
Bennett, Arthur Henry ... 1889
Bennett, John 1870
Berridge, Alfred... 1889
Billson, Chas James, M.A. ... 1883
Billson, Henry 1871
Billson, William 1852
Bolton, Frederick 1889
Bolus, Arthur 1889
Bond, Charles James, F.R.C.S. 1887
Bramley, William Forrester ... 1868
Brierly, Jas. L. 1880
Broadbent, Stanley 1889
Brown, George 1889
Brown, Henry 1886
Browne, Montagu 1889
Burdett, Fergus... 1888
Burford, Samuel Francis ... 1884
Burton, John William 1874
Butler, Edward Henry... ... 1889
Caillard, Ernest... 1889
Carnley, Samuel Birch... .. 1879
Carter, Thomas, LL.B. ... 1872
Catlow, George Spawton ... 1883
Challis, Francis James 1877
Chamberlain, Lionel Percy ... 1875
Chamberlin, William Henry ... 1889
Chappel, Miss 1889
Chattaway, John Gordon ... 1880
Clark, Miss H. 1889
Clarke, John Webster 1870
Clarke, Samuel 1850
Clements, R. Newton 1885
Clephan, Edwin... 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A. ... 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cooper, Chas. Wm., M.D. ... 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cowan, George 1871
Craig, John Thomas 1889
Crofts, John Ephraim 1880
Curtis, Robert 1889
Davis, John Henry 1886
Davis, Samuel 1871
Davis, Samuel (*Hinckley*) ... 1884
Dawson, Rev. Ambrose Pudsey, M.A. (*Kibworth*) 1878
Deakin, John 1874
Donisthorpe, Hamilton ... 1886
Draper, Arthur Thomas ... 1879
Dutton, Edmund 1889
Elgood, George Samuel ... 1887
Elgood, Thomas Scott 1885
Ellery, Henry George 1886
Ellis, Arthur D.... 1889
Ellis, Benjamin 1889
Ellis, Ernest Edward 1879
Ellis, Mrs. E. S. *(deceased)* ... 1886
Ellis, Frederick 1881
Ellis George Henry *(deceased)* 1870
Ellis, Herbert 1886
Ellis, Mrs. James 1886
Ellis, Mrs. J. H. 1886
Ellis, Owen Alfred 1889
Ellis, R. H. 1889
Ellis, Theodore, J. 1889
Ellis, Wilfrid Henry 1885
Else, Alfred 1860
Else, Miss Mary Elizabeth ... 1887
Elton, Joseph William... ... 1875
Evans, Arthur 1881
Evans, Thomas Merritt ... 1859
Evans, William 1858
Everard, John Breedon... ... 1870
Ewen, Arthur 1889
Ewing, Henry F. 1889
Finch, John E. Montagu, M.D. 1870
Firth, Solomon 1889
Fleming, Josiah... 1880
Forsyth, Rev. Peter T., M.A. .. 1888
Fortescue, Rev. HughJohn, M.A. 1877

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Franklin, George Barton ... 1849
Froane, James 1870
Gardiner, Charles Laurence ... 1889
Garnar, John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George 1878
Gibbs, Arthur W. 1886
Gimson, Arthur James... ... 1879
Gimson, Josiah 1887
Gimson, J. Mentor 1872
Gimson, Sydney Ansell ... 1883
Gittins, Miss Edith 1886
Goddard, Miss E. A. 1886
Goddard, Joseph 1878
Goward, Rowland Sydney ... 1883
Green, George 1870
Green, James 1879
Green, Septimus E. J. 1889
Grimsdick, George J. 1886
Grundy, Walter Edward ... 1873
Gunn, Thomas James 1874
Hack, Matthew 1860
Hames, Joseph 1844
Hardy, Arthur 1880
Harper, George Povey, M.A. ... 1885
Harris, Joseph 1862
Harris Samuel 1889
Harrison, Stockdale 1889
Hart, Israel 1885
Harvey, Joseph 1870
Harvey, Robert, LL.B. ... 1877
Hawkes, James 1883
Hewitt, Francis... 1862
Hibbert, George Radford ... 1882
Higgins, William Henry, M.B. 1883
Higgs, Alfred M.D. 1883
Hitchcock, James William ... 1877
Hobson, William Stephen ... 1876
Hodges, Frank Henry 1885
Hodges, George Henry... ... 1860
Hodges, John Edward 1860
Hopps, Rev. John Page ... 1876
Howcutt, Miss 1887
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Robert *(deceased)* 1865
Hunt, Mrs. William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jackson, William 1863
Jacques, Edwin 1873
Jarvis, John William 1889
Johnson, Mrs. Payne *(deceased)* 1886
Johnson, Thomas Fielding ... 1852
Johnson, Thomas Fielding, jun. 1880
Jones, George Howell 1874
Jones, Thomas 1884
Kelly, Wm., F.R.H.S., F.S.A. 1837
Kempson, William 1849
Kidney, John 1889
Kilby, Edwin Charles 1885
Kirby, George Langford ... 1884
Kirby, John 1872
Kirwan, George R., M.A. ... 1889
Knowles, Jno. Jas. Worthington 1889
Lawrence, Joseph Charles ... 1876
Lawford James 1872
Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Leicester, Miss Ellen 1886
Lennard, Samuel 1889
Lewis, Rev. Martin Luther ... 1883
Livens, Frederick 1874
Lloyd, Thomas Howard ... 1889
Lockhart, Philip H. 1886
Loseby, Edward Thomas ... 1878
Lovell, John J. 1879
Mackennal, Miss Gertrude ... 1889
Major, Henry, B.A., B.Sc. .. 1889
Marris, Samuel Arthur... ... 1889
Mason, Charles 1889
Maxfield, Matthew ... ...
McCall, John Henry 1886
Milne, John 1883
Moore, Chas. Arthur, M.D. ... 1883
Moore, Alfred Percival, M.A.... 1887
Moore, E. 1889
Moore, Frank 1884
Mott, Frederick Thompson 1849
Murray, Mrs. J. T. A. 1889
Newby, William Thomas ... 1873
Noble, Miss 1888
Oldershaw, Christopher ... 1885
Overton, Robert 1885
Packe, Charles, F.L.S. (*Stretton Magna*) 1874
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Paget, Miss E. S. 1889
Pattison, Ernest 1887
Paul, John Dennis, F.G.S. ... 1877
Payne, George 1879
Peake, William Pemberton ... 1889
Pegg, Abraham 1873
Pegg, Charles 1886
Pegg, John 1879
Pickard, Ezra 1885
Pilgrim, John Thomas... ... 1863
Plant, James F.G.S. 1866
Pochin, Robert 1885
Pollard, William Gamble ... 1885
Pope, Frank Montagu, M.D. ... 1885
Preston, Rev. Thomas Arthur, M.A. (*Thurcaston*) 1885
Ranson, George 1875
Raven, William... 1886

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Redfern, Francis 1889
Rendell, Rev. Arthur Medland, M.A. 1889
Richardson, John George Fredk. 1886
Roberts, Joseph Drayton ... 1879
Roberts, Thomas 1880
Robinson, Charles Stephen ... 1879
Roechling, H. Alfred 1888
Roper, Joseph 1870
Rowlett, William Tertius .. 1885
Royce, David C., jun. 1881
Russell, Herbert 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of 1888
Sarson, John Edward 1880
Scampton, John 1870
Sculthorpe, William 1886
Shaw, Mrs. Lucy 1887
Simmons, James 1885
Simpson, J. Woodhouse ... 1886
Simpson, Larrat 1889
Simpson, William 1877
Sloane, John, M.D. 1883
Spencer, Charles Alfred ... 1884
Spencer, William 1883
Squires, Miss Augusta 1887
Stafford, John 1852
Stafford, John Thomas... ... 1877
Stanion, Oliver Bown 1889
Stanyon, William 1874
Stevenson, George 1844
Stevenson, George Frederick ... 1883
Stocks, Rev. Jno. Edward, M.A. 1889
Strangways, C. Fox 1889
Stretton, Clement 1850
Stretton, Clement Edwin, C.E. 1886
Swain, Robert Paddy 1879
Tait, James 1873
Taylor, Richard... 1889
Taylor, Thomas Smithies ... 1886
Taylor, William... 1886
Thompson, William Thomas ... 1881
Thorp, John T. 1870
Tindall, William Henry ... 1888
Toller, George 1889
Toller, Richard 1835
Toller, Richard Seddon ... 1886
Tollington, Arthur 1889
Tomkins, Henry, M.D. ... 1885
Toone, Joseph 1879
Turner, Alfred 1889
Turner, William Henry ... 1881
Vaughan, Rev. David J., M.A. 1860
Viccars, William Purden ... 1885
Vice, John Henry 1885
Vice, William Armston ... 1880
Vipan, James Vipan 1885
Wakerley, Arthur 1889
Walker, Theodore 1869
Wallace, William J. 1889
Wand, Stephen 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Waring, John Barker 1889
Wartnaby, John Wade 1876
Wates, Benjamin Cunningham 1877
Watson, Edward 1889
Went, Rev. James, M.A. ... 1877
Whitehead, Henry 1872
Whitmore, Walter *(deceased)* ... 1883
Willby, Mrs. 1888
Willcox, Samuel 1879
Williams, John Heath 1854
Williams, William Maurice ... 1889
Wilson, Alfred Widnell ... 1882
Winterton, William 1854
Winterton, William Henry ... 1879
Wood, Edward 1889
Wooding, George 1872
Woodruffe, Rev. Jno. Nun Blacker, M.A. 1889
Woolston, Richard 1871
Wright Thomas... 1886
Wright, Thomas Harry ... 1889
Wright, William 1881
Wykes, Alfred 1878
Wykes, Arthur Boud 1885

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ASSOCIATES.

Ashwell, Frank	1889	Jarvis, Miss	1887
Atkins, William (*Market Harboro'*)	1887	Jones, Miss Rose Evelyn ...	1886
Cartwright, Mrs. James ...	1876	Lewitt, Miss A.	1877
Charters, Mrs. Robert	1887	Lewitt, Frederick William ...	1889
Crossley, Miss L.	1889	Lilley, Samuel John	1887
Edge, Miss	1888	Payne, Miss Caroline Edith ...	1882
Ellis, Bernard	1888	Payne, Miss Eva	1882
Francis, Mrs.	1889	Plant, Mrs. Nathaniel	1887
Freer, William Jesse	1889	Sandford, Rev. Folliott, M.A....	1889
Freers, Miss M.	1889	Sharland, Thomas	1889
Froane, Miss H....	1876	Smith, James	1889
Fuller, Cecil Charles	1887	Smith, Miss	1884
Goadby Mrs.	1880	Steads, Miss Angela	1885
Green, Miss	1883	Stevenson, Miss E.	1889
Haymes, Mrs.	1874	Stone, Miss E.	1889
Hottinger, Miss...	1874	Viccars, Mrs. George	1887

HONORARY MEMBERS.

G. A. K. Wilkes, M.D.	
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham*	1847
John Lawrence, *Elton, Peterborough*	1843
C. Liddell, C.E., *London*	1848
John Smeeton, *London*	
C. Roach Smith, F.S.A., *Strood, Kent*	1853
John Rae, M.D., LL.D., *Hudson's Bay House, London*	1854
Major-General The Hon. Leicester Smythe. C.B. (formerly Curzon)	1855
James Hemming Webb. *Melbourne, Victoria*	1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London*	1861
Walter H. Bates. *London*	1861
John Halford, *Cape of Good Hope*	1866
Rev. R. Harley, F.R.S., F.R.A.S., *4, Wellington Square, Oxford*	1874
Rev. C. C. Coe, F.R.G.S., *Bolton*	1874
Rev. J. Spittal, M.A., *Haywood Rectory, Manchester*	1874
Rev. A. MacKennal. B.A., *Bowden, Manchester*	1877
Rev. W. Romains. M.A., *Wigston*	1879
Rev. J. P. O. Tomkins, B.A., *Kilby, Leicestershire*	1885
Alfred Paget, J.P., *Leicester*	1887

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Report of the Council.

THE present Annual Report of the Council records the proceedings of the Society during its FIFTY-FIFTH Session.

ROLL OF MEMBERS.

Subscribing Members, 1888-89		249	
Lost by Death	2		
„ Removal	1		
„ Resignation	12—15		
		234	
New Elections during the Session—Gentlemen ...	55		
Ladies ...	5—60		
Subscribing Members, 1889-90		...	294
Associates, 1888-89		25	
Lost by Death	0		
„ Removal	0		
„ Resignation	4		
		21	
New Elections during the Session		11	
Associates, 1889-90			32
Total Subscribing Members and Associates, 1889-90			326
Honorary Members, 1889-90			20
Total			346

WORK OF THE SESSION.

Twelve General Meetings of the Society have been held during the Session, at which six professional and six non-professional Lectures have been delivered. Mr. CARL ARMBRUSTER'S Lecture was given in the Temperance Hall; all the others in the Museum Lecture Hall. The Inaugural Address of the PRESIDENT, and short abstracts of the Lectures have been published in the Society's Transactions.

The Programme of the General Meetings was as follows:—

1889.

Oct. 7.—Inaugural Address of the President (J. D. PAUL, Esq., F.G.S.).

„ 21.—CARL ARMBRUSTER, Esq. "The Life, Theory, and Works of Richard Wagner," with numerous Vocal and Instrumental Illustrations. Vocalist, Miss PAULINE CRAMER. Pianoforte, The LECTURER.

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Nov. 4.—Canon CREIGHTON, of Worcester. "The Coming of the Friars."

,, 18.—A. H. PAGET, Esq. Recital from "As You Like It."

Dec. 2.—Mrs. HENRY FAWCETT. "John Wiclif, and the Dawn of the Reformation in England."

,, 16.—HENRY NEVINSON, Esq., M.A. "Robert Browning."

1890.

Jan. 13.—Professor W. H. FLOWER, C.B., LL.D., F.R.S., &c. (President of the British Association). "Pigmies."

,, 27.—F. M. POPE, Esq., M.B. "Dreams."

Feb. 10.—T. MATESDORF, Esq. "Raffaelle's Masterpiece," (Illustrated by the Oxy-hydrogen Light).

,, 24.—CHARLES J. BILLSON, Esq., M.A. "The English Novel."

Mar. 10.—FRANK E. BEDDARD, Esq., M.A. (Prosector to the Zoological Society of London, and Davis Lecturer). "The Colours of Animals."

,, 24.—G. R. KIRWAN, Esq., M.A. "Early Elizabethan Dramatists."

The average attendance at the Professional Lectures has been 382; at the non-Professional Lectures, 280. The average attendance at all the Lectures of the Session was therefore 331, an increase of no less than 94 upon the average attendance of the previous Session. It should also be noticed that at some of the earlier Lectures of the Session the Lecture Hall was completely filled, and many late-comers, who would have increased the above average, were obliged to turn back at the door.

THE SECTIONS.

The Council are glad to announce that the amalgamation of Sections E and C, which was mentioned in their Report of last year, has been carried out. At a joint meeting of the members of Section E, and those of the late Geological Section C, which was held in the month of October last, a resolution was passed to the following effect:—"As Section C no "longer exists, its former members are invited to join Section E; and in "future Papers relating to Geology and Palæontology will be read in the "latter Section." There are, therefore, at the present time three Sections, viz.: Section A for Archæology, Literature, and Economics; Section D for Zoology and Botany, and Section E for Zoology and Geology. The Annual Reports of these Sections show that the number of their members has increased, and that they are all doing good work. They have all contributed papers to the Society's Transactions. The two Scientific Sections complain that their work is greatly impeded by the inadequate accommodation at present provided for them.

THE TRANSACTIONS.

Four numbers of the New Quarterly Series of Transactions have been published during the past year. The number published in July, 1889,

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included a Title page and Indices to be bound up with the first 12 numbers of the New Series of Transactions, and the Annual Reports for the years 1886, 1887, and 1888. A Second Volume of Quarterly Transactions was commenced last October and three numbers have been published.

ACCOMMODATION OF THE SOCIETY.

This question has again been brought (by a Committee appointed by the Council in November last for considering the best means of obtaining better accommodation) before the Museum Committee of the Town Council, and has been carefully considered by them; and your Council are assured that a definite reply will shortly be received. The increase in the attendance at lectures has made more manifest than ever the imperative necessity for the removal of the cases from South Kensington which now obstruct the Lecture Hall. Your Council have no doubt that the question will be settled before the commencement of the next Session.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

Your Council have invited the Union to hold their Thirteenth Annual Meeting at Leicester, on Thursday and Friday, 18th and 19th Sept., 1890, and their invitation has been accepted. The proceedings will include a Conversazione, to be held on the Thursday evening, and an Excursion into the Country on Friday. This Excursion will take the place of the ordinary Excursion of the Society.

POSITION OF THE SOCIETY.

At the commencement of the Session, the Council, feeling that the objects and advantages of the Society were not very widely known, directed the Corresponding Secretary to prepare a Prospectus giving short particulars of the History, methods, and privileges of the Society. Copies of this Prospectus, together with a circular letter from the Corresponding Secretary, containing a list of the Lectures for the coming Session, were sent by post to about 500 of the principal residents in the town and county, who were invited to send in their names to be proposed as Members or Associates of the Society. The result has been a considerable increase in the number of Members and Associates, which is now greater than it has ever been. The corresponding growth in the Society's income has given the Treasurer a handsome balance on the year's account, in spite of some increase in the expenditure.

Copies of the Prospectus can be obtained on application at the Museum.

NEW PRESIDENT.

The Council have unanimously elected F. T. Mott, Esq., as President for the ensuing Session.

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LEICESTER LITERARY AND PHILOSOPHICAL SOCIETY.

Statement of Accounts.—Session 1889-1890.

Dr. *RECEIPTS.*

	£	s.	d.	£	s.	d.
To Balance in Treasurer's hands=						
General Fund	5	2	9			
Boulder Fund	4	0	0			
				9	2	9
„ Members' Subscriptions				309	15	0
„ Associates' „				17	6	6
„ Sale of Chromo-Lithographs of Roman Pavement				4	10	0
„ Sale of Quarterly Transactions					10	6
„ „ Additional Ticket					7	6
„ „ Tickets, Armbruster's Lecture ...	2	2	6			
„ „ Programmes „ ...	2	4	6			
				4	7	0
				£345	19	3

PAYMENTS. *Cr.*

	£	s.	d.	£	s.	d.
By Rent of Rooms at Museum				75	0	0
„ Expenses connected with Lectures at the Society's Meetings—						
Lecturers' Fees	61	14	0			
Incidentals connected with Lectures ...	14	7	6			
				76	1	6
„ Subscriptions—						
Midland Union of Natural Hist. Societies	3	2	3			
Scottish Meteorological Society ...	0	10	6			
Vertebrate Animals, 2 vols.	0	18	6			
				4	11	3
„ Printing and Stationery				76	1	9
„ Advertising				12	5	6
„ President's Portrait				3	3	0
„ Lithographs of Chondrosteus				5	15	6
„ Collecting Subscriptions				6	6	0
„ John Biggs, gratuity				4	4	0
„ Delivery of Circulars				2	10	0
„ Miscellaneous Expenses				11	6	3
„ Balance in Treasurer's hands—						
General Fund	64	14	6			
Boulder Fund	4	0	0			
				68	14	6
				£345	19	3

Examined and found Correct, June 20th, 1890. { E. CLEPHAN. T. C. LEE.

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Officers of the Sections.—1889-90.

———:o:———

SECTION "A" ... ... MR. T. CARTER, L.L.B., CHAIRMAN, London Road.

MR. JOHN SCAMPTON, SECRETARY, 1, Pelham Street, Welford Road.

SECTION "D." ... ... MR. F. T. MOTT, F.R.G.S., CHAIRMAN, Birstall Hill.

MR. J. J. W. KNOWLES, SECRETARY, 25, St. Stephen's Road.

SECTION "E." ... ... MR. F. M. POPE, M.B., CHAIRMAN, Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY, Town Musuem.

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Officers of the Sections.—1890-91.

———:o:———

SECTION "A." ... ... MR. WM. SIMPSON, CHAIRMAN,
1, Brighton Villas, Princess Street.

MR. JOHN SCAMPTON, SECRETARY,
1, Pelham Street, Welford Road.

SECTION "D." ... ... REV. T. A. PRESTON, CHAIRMAN,
Thurcaston Rectory.

MR. J. J. W. KNOWLES, SECRETARY,
25, St. Stephen's Road.

SECTION "E." ... ... MR. F. M. POPE, M.B., CHAIRMAN,
Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY,
Town Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—THOMAS CARTER, Mill Hill House.

Secretary—J. SCAMPTON, 1, Pelham Street.

Members.

ATKINS, A. F.
BAKER, CHAS.
BENNETT, A. H., M.A.
BILLSON, C. J., M.A.
BURDETT, F.
CARTER, THOS., LL.B.
DAWSON, Rev. A. P., M.A.
FRANKLIN, G. B.
GARNAR, J. H.
GIMSON, J. M.
HARPER, G. P., M.A.
HARVEY, JOSEPH
HARVEY, R. LL.B.
JACKSON WILLIAM
JONES, THOS.
KELLY, W., F.S.A.
KIRWAN, G. R., M.A.
LEWIS, M. L., M.A.
LEE, T. C.
MOTT, F. T.
MOORE, A. P., M.A.
PAGET, A. H.
PAUL, J. D., F.G.S.

Members—(continued).

STEVENSON, G. F.
SIMPSON, WILLIAM
TAYLOR, W.

Sectional Associates.

BILLSON, Mrs. C. J.
BILLSON, Miss C.
BRODIE, J. D.
COOPER, C. J.
DAWSON, Mrs. A. P.
ELLIS, Miss H.
FOSBROOKE, T. H.
HARVEY, Mrs. R.
HARPER, Mrs. G. P.
HARPER-VERNON, Miss
HAYES, Miss E. A.
HEARNE, F. S.
ISLIP, Mrs.
ROLLESTON, A. F.
SQUIRES, Miss A.
STANYON, Miss L.
TAYLOR, T. C.

There have been six Meetings held, with an average attendance of ten members.

The names of Mr. A. F. ATKINS, Mr. T. H. FOSBROOKE, Mr. A. H. BENNETT, and Mr. G. R. KIRWAN have been added to the list of members of the Section.

Papers read—

October 15, 1889. The CHAIRMAN opened the Session by reading a Paper on the "*Characteristics of Savage Life.*"

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November 19, 1889. Mr. Wm. SIMPSON, "*Shakspere's Jesters.*"

December 17, 1889. Mr. T. H. FOSBROOKE, "*Ashby Castle.*"

January 21, 1890. Mr. ROBERT HARVEY, LL.B., "*The Elements of Pictorial Effect.*"

February 18, 1890. Miss E. A. HAYES, "*Criticism Criticised.*"

March 18, 1890. Mr. G. P. HARPER, M.A., "*Henry Thos. Buckle.*"

At the last Meeting, Mr. WM. SIMPSON was elected Chairman of the Section for the ensuing Session, and Mr. JOHN SCAMPTON was re-elected Secretary.

T. CARTER, *Chairman.*

REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY & BOTANY).

1889-90.

Roll of Members and Sectional Associates.

Chairman—F. T. MOTT, Birstal Hill, Leicester.

Secretary—J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

Members.	*Sectional Associates.*
BARFOOT, W.	AGAR, Rev. W.
BILLSON, C. J., M.A.	ANDERSON, Miss
BURFORD, S.	BATES, F.
CARTER, T. LL.B.	BOLUS, Miss
COOPER, E. F., F.L.S.	BOUSKELL, F.
COOPER, C. W., M.B.	BURN, J.
FINCH, J. E. M., M.D.	ELLIOTT, O. T.
GARNAR, J. H.	EMILLE, Miss
GRUNDY, W. E.	GILBERT, F.
HOTTINGER, Miss	GRUNDY, Miss
OVERTON, R.	HEADLEY, C. B.
PRESTON, Rev. T. A., M.A.	JACOT, Miss
THORP, J. T.	JOHNSON, Miss
TOMKINS, H., M.D.	KINDER, Miss
TURNER, C. G.	MOTT, Mrs.
VICE, W. A., M.B.	NOBLE, Miss
	NOBLE, Miss C.
	PALMER, J.
	QUILTER, H. E.
	SHENTON, Miss
	STORER, G. H.
	WATCHORN, T.

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Members, 40; viz.:—Members of the Society, 18; non-members, 22. One member has left during the year, and eight new ones have been elected, making an increase of seven.

Evening Meetings:—The third Wednesday in each month, at 7 p.m., at the Museum.

Field Days:—The second Wednesday in each summer month, at 3 to 4 p.m.

During the past year the Section has held eleven evening meetings, with an average attendance of thirteen members; viz.:—nine gentlemen and four ladies; the maximum number being twenty and the minimum five.

The objects announced for Special Exhibition at these meetings have been—

June, 1889.	*Aphides of various species.*
July.	*Germinating Seeds, showing Cotyledons.*
September.	*Living Frogs, for observations on their markings.*
October.	*Autumnal Foliage and Fungi.*
November.	*Bird Skins.*
December.	*Coleopterous Insects.*
Jan., 1890.	*Marine Shells and Corals.*
February.	*Seaweeds.*
March.	*Spring Flowers and Insects.*
April.	*Leaf and Flower Seeds, for the study of Vernation and Æstivation.*
May.	*Caterpillars.*

On most occasions a number of interesting specimens have been brought together, affording much instruction to the members. Many other objects have also been exhibited, including Birds' Eggs, by Mr. PALMER, and Garden Flowers from Cornwall, by Miss HOTTINGER.

The following Papers have been read and discussed, viz.:—

June, 1889.	"*House Flies*," by Mr. W. A. VICE, M.B.
July.	"*Discussion on Pangenesis*," introduced by the CHAIRMAN.
September.	"*The Leicestershire Cruciferæ*," by the CHAIRMAN.
October.	"*A comparison between the Linnæan and Natural Systems of Classification*," by the Rev. T. A. PRESTON, M.A.
November.	"*The Preservation of Birds' Skins for Museums and Cabinets*," by Mr. G. H. STORER.

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December. "*Spiders*," by Rev. W. AGAR.

Jan., 1890. "*The Development of Museums as Public Educators*," by the CHAIRMAN.

February. "*The Teaching of Botany*," by Miss HOTTINGER.

March. "*Micro-fungi*," by Mr. W. A. VICE, M.B.

April. "*Vernation and Æstivation*," by Rev. T. A. PRESTON, M.A.

May. "*The Leguminosæ of Leicestershire*," by Dr. COOPER.

Five field Meetings have been held during the year, viz. :—

June, 1889. To the Botanical Gardens in the Abbey Park.

September. To St. John's Stone, near Leicester, and the Castle Hill, Beaumont Leys, and thence to the CHAIRMAN'S house at Birstal Hill.

April 1890. To Buddon Wood and Mountsorrel Hill.

May 8th. To Belvoir Castle, where W. INGRAM, Esq., kindly conducted the party through the beautiful grounds and gardens.

May 14th. To Bardon Hill.

Particulars of these excursions, and of the evening meetings, with some of the papers *in extenso*, will be found in the Quarterly Transactions of the Society.

Rev. T. A. PRESTON, M.A., of Thurcaston Rectory, has been elected Chairman of the Section for the ensuing year; and Mr. J. J. W. KNOWLES has been re-elected as Hon. Secretary.

With the yearly increase in members, the accommodation provided at the Museum becomes more and more inadequate, and this greatly impedes the work of the Section.

F. T. MOTT, *Chairman*.

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REPORT OF SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—F. M. POPE, B.A., M.B., Campbell House.

Secretary—F. R. ROWLEY, Town Museum.

Members.

ANDERSON, J. S.
BATES, E. F.
BOND, C. J., F.R.C.S.
BROWNE, MONTAGU, F.Z.S., F.G.S.
CLEMENTS, R. N., L.R.C.P.
DRAPER, A. T.
HARVEY, R., LL.B.
MOORE, C. A., M.D.
MOORE, E.
PATTISON, E.
PAUL, J. D., F.G.S.
PAYNE, MISS.
RUST, A.
SQUIRES, MISS A.
STRANGWAYS, C. FOX, F.G.S.
VICE, W. A., M.B.
WALKER, T.

Associates.

BAKER, A. E.
BARBER, MISS M.
BOUSKELL, F.
BROWN, T.
BURCHNALL, W.
BURROWS, T.
DAVIES, J. T., M.D.
ELLIOTT, O. T.
EVANS, W. A.
GRISWOLD, H. G.
HARVEY, R. WARDEN.
HEADLEY, B.
HODGES, L.
HOW, F. F.
LAWRENCE, J.
LEWITT, B.
LLOYD, W. H.
MACAULAY, T., M.R.C.S.L.
MACLACHLAN, G.
MATTHEWS, REV. A., M.A.
PALMER, G.
PARR, J. G., F.R.C.V.S.E.
PARSONS, C.
PYCRAFT, W. P.
QUILTER, H. E.
SPARKES, REV. A. L., M.A., B.Sc.
SQUIRES, MISS.
SNAITH, F.
STORER, G. H.
WARD, G.

The past year has been one of uninterrupted prosperity in the annals of the Section, which is to be congratulated on having lost no members, by resignation or otherwise. On the contrary, fifteen new names have been added to the list, bringing the total at present on the roll up to 49.

An important event has been the amalgamation of the late Geological Section "C" with Section "E." The work of the first-named Section was discontinued, owing to the difficulty experienced in obtaining readers

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of papers, and from other causes, but it was felt that rather than allow the work to be altogether dropped, the members should be induced to join one of the remaining Sections, whose sphere of work should be enlarged accordingly. This was done, and the scheme has, up to the present, been found to work very well, the list of papers appended affording ample evidence that Geology and the Palæontological aspect of Zoology have not been neglected.

Excursions to Bardon Hill and Wistow Park took place in May and June, both being very enjoyable. For permission to visit the places named, the members are indebted to W. T. Everard, Esq., and Sir Henry St. John Halford, Bart.

The evening meetings have, throughout, been most successful. Not only have the papers been of more than average interest, but the exhibits have, in many cases, comprised objects of exceptional beauty and instructiveness, several also being of great rarity.

The following papers and short communications have been read at the evening meetings of the Section, viz. :—

May 6, 1889. "*On a simple form of Constant-Pressure Injecting Apparatus for Histological Work*," by the SECRETARY. (Illustrated).

June 3. "*Remarks on the habits of the Smooth Blenny (Blennius pholis), and Viviparous Blenny (Zoarces viviparus)*," by Mr. G. H. STORER. Illustrated).

"*Notes on Leicestershire Myriapoda*," by Mr. H. E. QUILTER.

July 15. "*On a Fossil Fish (Chondrosteus), from Barrow-on-Soar, hitherto recorded only from Lyme Regis*," by Mr. MONTAGU BROWNE, F.Z.S., F.G.S. (Illustrated).

September 2. "*Centipedes and Millipedes*," by Mr. H. E. QUILTER. (Illustrated).

October 14. "*The Fore-limb of Vertebrates*," by the CHAIRMAN. (Illustrated).

November 11. "*The changes in an Egg during Incubation*," by Mr. C. J. BOND, F.R.C.S. (Illustrated).

December 9. "*A contribution to the history of the Rhætics and Lias in Leicestershire*," by Mr. MONTAGU BROWNE, F.Z.S., F.G.S. (Illustrated).

"*Notes on some Lias Ammonites collected by Mr. Montagu Browne*," by Mr. H. E. QUILTER.

January 20, 1890. "*A preliminary note on certain extinct Fishes of the Genus Dapedius from Barrow-on-Soar*," by Mr. MONTAGU BROWNE, F.Z.S., F.G.S. (Illustrated).

February 17. "*Pterylosis of the Wing in the Wild Duck (Anas boscas (L)*," by Mr. W. P. PYCRAFT. (Illustrated).

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March 17. '*On the American Beaver (Castor canadensis), including notes made by a correspondent whilst resident in the Nipigon district*," by Mr. G. H. STORER. (Illustrated).

April 14. "*Notes of my observations at the Great Salina*," communicated by the Rev. A. L. SPARKES, M.A., B.Sc., (corresponding member).

May 19. "*A supplementary contribution to the History of the Fossil Fishes of the Rhætics of Leicestershire*," by Mr. MONTAGU BROWNE, F.Z.S., F.G.S. (Illustrated).

F. M. POPE, *Chairman*.

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RULES OF THE LEICESTER
LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Object. THE object of the Society shall be the general cultivation of Literature, Science, and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, a Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council, shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality, a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meeting, in conformity

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with Rule I. The discussion of theological or political questions, either by Lecturers or Speakers, is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately destroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Sections, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next meeting of the Council, and submitted for election at a subsequent Meeting. All such elections shall be announced at the ordinary meeting of the Society next ensuing.

IX.

Subscriptions.

Each Member shall pay an annual subscription of one Guinea, which shall entitle him (1) to a Member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII.

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s. 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors. Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentleman resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations. Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds. After payment of the expenses of the Society, any surplus Funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alterations of Rules. No rule shall be made, rescinded, or altered, without the consent of two-thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-Laws, &c. The Council shall have power to make By-laws and Regulations not inconsistent with the foregoing Rules.

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By-Laws

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council on the 4th of November, 1887, adopted the following By-laws in the place of those then existing.

1.—Any Member or Associate of the Society may join any Section upon giving in his or her name to the Secretary of that Section, and paying to its funds an Annual Subscription of 1 -.

2.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2 6 to the funds of such Sections.

3.— Each Section shall elect annually a Chairman and Secretary. The Chairman shall be a Member of the Society.

4.—For Sectional purposes the year shall terminate on the 31st of May, and the Annual Election of Officers by each Section shall take place at the Meeting of the Section next preceding that date. Casual vacancies shall be filled up as they occur by the Sections respectively. All Elections of Sectional Officers shall be reported to the next ensuing Meeting of the Council.

5.—Each Section shall, on or before the first Friday in March, June, September, and December, present to the Council a Quarterly Report of its Transactions and a Statement of the Meetings to be held during the ensuing quarter, which, subject to the approval of the Council, shall be published in the Quarterly Transactions of the Society. Each Section shall, if practicable, at the same time present to the Council at least one paper *in extenso* read before that Section, and the Council may direct that any such paper shall be printed in the Quarterly Transactions of the Society, with all necessary illustrations, in such form and manner as the Chairman of the Section shall recommend.

6.—The Quarterly Report of each Section, presented on or before the first Friday in June and published in the July number of the Transactions, shall be made up to the 31st of May, and shall contain in addition to the Quarterly Transactions of the Sections, the Roll of Members, the names of the Officers of the past year, and of those elected for the ensuing year, and an abstract of the work of the Section during the past twelve months.

7.—The Council may, on the application of any Section, make grants of money for any object connected with the work of the Sections.

8.—Any six Members or Associates of the Society who desire the establishment of a new Section, may memorialize the Council to that effect, but no Section shall be established without the consent of the Council.

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ANNUAL REPORTS

OF THE

LEICESTER

Literary & Philosophical Society.

FIFTY-SIXTH SESSION,

1890—91

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OFFICERS OF THE SOCIETY FOR THE PAST SESSION, 1890-91.

President:

F. T. MOTT, Esq., F.R.G.S.

Vice-Presidents:

THOMAS CARTER, LL.B.
E. F. COOPER, F.L.S.
J. D. PAUL, F.G.S.
GEORGE STEVENSON.

Council:

Retiring June, 1891.	Retiring June, 1892.
H. BILLSON.	C. J. BOND, F.R.C.S.
A. T. DRAPER.	C. W. COOPER, M.B.
J. E. M. FINCH, M.D.	HERBERT ELLIS.
G. B. FRANKLIN.	REV. P. T. FORSYTH, M.A.
J. M. GIMSON.	R. HARVEY, LL.B.
W. JACKSON.	W. KEMPSON.
A. P. MOORE, M.A.	J. J. W. KNOWLES.
C. A. MOORE, M.D.	T. C. LEE.
A. H. PAGET.	M. L. LEWIS, M.A., LL.M.
JAMES PLANT, F.G.S.	F. M. POPE, M.B.
HENRY TOMKINS, M.D.	REV. T. A. PRESTON.
W. A. VICE, M.B.	REV. J. WENT, M.A.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, C. J. BILLSON, M.A.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1891-92.

President:

R. HARVEY, Esq., LL.B.

Vice-Presidents:

F. T. MOTT, F.R.G.S.
J. D. PAUL, F.G.S.
E. F. COOPER, F.L.S.
GEORGE STEVENSON.

Council:

Retiring June, 1892.	Retiring June, 1893.
C. J. BOND, F.R.C.S.	C. J. BILLSON, M.A.
THOMAS CARTER, LL.B.	H. BILLSON.
C. W. COOPER, M.B.	A. T. DRAPER.
HERBERT ELLIS.	J. E. M. FINCH, M.D.
REV. P. T. FORSYTH, M.A.	G. B. FRANKLIN.
W. KEMPSON.	A. P. MOORE, B.C.L.
J. J. W. KNOWLES.	C. A. MOORE, M.D.
T. C. LEE.	A. H. PAGET.
M. L. LEWIS, M.A., LL.M.	JAMES PLANT, F.G.S.
F. M. POPE, M.B.	HENRY TOMKINS, M.D.
REV. T. A. PRESTON, M.A.	W. P. VICCARS.
REV. J. WENT, M.A.	W. A. VICE, M.B.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, J. MENTOR GIMSON.
Financial „ GEORGE HULL
Minute „ W. SIMPSON.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:—

Under the old Deed of Transfer from the Society.

THOSE ONLY ARE QUALIFIED TO ACT WHO REMAIN MEMBERS OF THE SOCIETY.

A. PAGET. | S. S. BANKART.

TOWN COUNCIL COMMITTEE:—

Ten Members of the Council:

ALD. KEMPSON, MAYOR, CHAIRMAN, *Ex-Officio.*
ALD. STAFFORD.
ALD STEVENSON.
MR. BIGGS.
MR. CLIFTON.
MR. ELSE.
MR. MOTT.
MR. PAYNE.
MR. ROYCE.
MR. SHIRES.

Six Gentlemen not Members of the Council.

H. BILLSON.
E. F. COOPER, F.L.S.
ALFRED PAGET.
A. H. PAGET.
J. D. PAUL, F.G.S.
A. RUST.

HONORARY CURATORS:—

ALD. KEMPSON.
J. D. PAUL, F.G.S.
ALD. PAGET.
A. H. PAGET.
H. BILLSON.
A. RUST.

CURATOR:—

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Adderly, Alfred 1873
Allen, Charles Gordon 1886
Almond, Thomas 1870
Aslett, W. S. 1890
Aspell, William Laxton ... 1889
Atkins, Arthur Frederick .. 1878
Atkins, Rev. Edward, B.Sc. ... 1876
Avery, John Frederick 1890
Baines, Alexander 1874
Baines, Miss Elizabeth 1890
Baines, William *(deceased)* ...
Baker, Charles 1861
Barfoot, William 1874
Barlow, Arthur Edward, M.D... 1888
Bates, Ernest Frederick ... 1889
Bates, William Henry 1862
Bennett, Arthur Henry ... 1889
Bennett, John 1870
Berridge, Alfred 1889
Billson, Chas. James, M.A. ... 1883
Billson, Henry 1871
Billson, William 1852
Blakesley, Henry John, F.R.C.S. 1890
Boam, F. W. 1890
Bolton, Frederick 1889
Bolus, Arthur 1889
Bond, Charles James, F.R.C.S. 1887
Bowmar, Walter Hammond ... 1890
Bramley, William Forrester ... 1868
Brierly, Jas. L. 1880
Brown, Henry 1886
Brown Jonathan 1890
Browne, Montagu 1889
Burdett, Fergus... 1888
Burford, Samuel Francis ... 1884
Burton, John William... ... 1874
Butler, Edward Henry... ... 1889
Caillard, Ernest... 1889
Carnley, Samuel Birch... ... 1879
Carnley, Walter Firth 1890
Carter, Thomas, LL.B ... 1872
Challis, Francis James... ... 1877
Chamberlin, William Henry ... 1889
Chappel Miss 1889
Charters, Mrs. Robert 1890
Chattaway, John Gordon ... 1880
Clark, Miss H. 1889
Clarke, John Webster 1870
Clarke, Samuel 1850
Clements, R. Newton 1885
Clephan, Edwin... 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A., *(Loughborough)* 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cooper, Chas. Wm., M.D. ... 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cooper, Rev. Leonard Leader, M.A. 1890
Cowan, George 1871
Craig, John Thomas 1889
Crofts, John Ephraim 1880
Davis, John Henry 1886
Davis, Samuel 1871
Dawson, Rev. Ambrose Pudsey, M.A. *(Kilworth)* 1878
Deakin, John 1874
De Lisle, Bernard *(Whitwick)* 1890
Donisthorpe, Hamilton ... 1886
Draper, Arthur Thomas ... 1879
Dutton, Edmund 1889
Duval, Henry 1890
Eames, Miss 1890
Edge, Miss 1890
Elgood, George Samuel ... 1887
Elgood, Thomas Scott 1885
Ellis, Arthur D. 1889
Ellis, Benjamin... 1889
Ellis, Ernest Edward 1879
Ellis, Frederick... 1881
Ellis, Herbert 1886
Ellis, Mrs. James 1886
Ellis, Mrs. J. H. 1886
Ellis, Owen Alfred 1889
Ellis, R. H. 1889
Ellis, Theodore J. 1889
Ellis, Wilfrid Henry 1885
Else, Alfred 1860
Else, Miss Mary Elizabeth ... 1887
Elton, Joseph William... ... 1875
Evans, Arthur 1881
Evans, Thomas Merritt ... 1859
Evans, William... 1858
Everard, John Breedon ... 1870

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Ewen, Arthur 1889
Ewing, Henry F. 1889
Finch, John E. Montagu, M.D. 1870
Firth, Solomon 1889
Fleming, Josiah 1880
Forsyth, Rev. Peter T., M.A.... 1888
Fortescue, Rev. Hugh John, M.A. 1877
Franklin, George Barton ... 1849
Froane, James 1870
Gardiner, Charles Laurence ... 1889
Garnar John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George 1878
Gibbs, Arthur W. 1886
Gimson, Arthur James... ... 1879
Gimson, Josiah 1887
Gimson, J. Mentor 1872
Gimson, Sydney Ansell ... 1883
Goadby, Mrs. 1890
Goddard, Miss E. A. 1886
Goddard, Joseph 1878
Goodliffe, A. 1890
Gordon, Mrs. Joseph 1890
Goward, Rowland Sydney ... 1883
Grant, Walter D. 1890
Green, George 1870
Green, James 1879
Green, Septimus, E. J.... ... 1889
Grimsdick, George J. (*Kibworth*) 1886
Grundy, Walter Edward ... 1873
Gunn, Thomas James 1874
Hack, Matthew 1860
Hampden, Rev. A. K. Hobart, M.A. 1890
Hardy, Arthur 1880
Harper, George Povey, M.A. ... 1885
Harris, Joseph 1862
Harris, Samuel 1889
Harrison, Stockdale 1889
Hart, Israel 1885
Hart, Joseph 1890
Harvey, Joseph 1870
Harvey, Robert, LL.B. ... 1877
Hawkes, James... 1883
Hewitt, Francis 1862
Hibbert, George Radford ... 1882
Higgins, William Henry, M.B. 1883
Higgs, Alfred, M.D. 1883
Hitchcock, James William ... 1877
Hobson, William Stephen ... 1876
Hodges, Frank Henry 1885
Hodges, George Henry... .. 1860
Hodges, John Edward 1860
Hopps, Rev. John Page ... 1876
Howcutt, Miss 1887
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Miss 1890
Hunt, Mrs. William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jackson, William 1863
Jacques, Edwin... 1873
Jarvis, John William 1889
Johnson, Thomas Fielding ... 1852
Johnson, Thomas Fielding, junr. 1880
Jones, George Howell 1874
Jones, Thomas 1884
Kelly, Wm., F.R.H.S., F.S.A. 1837
Kempson, William 1849
Kidney, John 1889
Kilby, Edwin Charles 1885
Kirby, John 1872
Kirwan, George R., M.A. ... 1889
Knowles, Jno. Jas. Worthington 1889
Langley, Rev. William, M.A. (*Narborough*) 1890
Lankester, Frank J. 1890
Lawford James 1872
Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Leicester, Miss Ellen 1886
Lennard, Samuel 1889
Lewis, Rev. Martin Luther ... 1888
Livens, Frederick 1874
Lloyd, Thomas Howard ... 1889
Lockhart, Philip H. 1886
Loseby, Ed. Thomas, (*deceased*) 1878
Mackennal, Miss Gertrude ... 1889
Marris, Samuel Arthur... ... 1889
Maxfield, Matthew ... ...
McCall, John Henry 1886
Milne, John 1883
Moore, Chas. Arthur, M.D. ... 1883
Moore, Alfred Percival, M.A.... 1887
Moore, Frank 1884
Mott, Fredk. Thompson F.R.G.S. 1849
Murray, Mrs. J. T. A.... ... 1889
Nevinson, Miss M. E. 1890
Newby, William Thomas ... 1873
Noble, Miss 1888
Oldershaw, Christopher (*deceased*) 1885
Overton, Robert... 1885
Packe, Charles, F.L.S. (*Stretton Magna*) 1874
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Paget, Miss E. S. 1889
Patey, Samuel 1890
Pattison, Ernest 1887
Paul, John Dennis, F.G.S. ... 1877
Payne, George 1879
Peake, William Pemberton ... 1889
Pegg, Abraham 1873
Pegg, Charles 1886
Pegg, John 1879

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Pickard, Ezra 1885
Plant, Horace Walter 1890
Plant, James, F.G.S. 1866
Pochin, Robert 1885
Pollard, William Gamble ... 1885
Pope, Frank Montagu, M.B 1885
Preston, Rev. Thomas Arthur, M.A. (*Thurcaston*) 1885
Raven, William... 1886
Redfern, Francis 1889
Rendell, Rev. Arthur Medland, M.A. 1889
Richardson, John George Fredk. 1886
Roberts, Joseph Drayton ... 1879
Roberts, Thomas 1880
Robinson, Charles Stephen ... 1879
Roper, Joseph 1870
Rowlett, William Tertius ... 1885
Royce, David C., jun. 1881
Royce, George Applebee ... 1890
Russell, Herbert 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of 1888
Sarson John Edward 1880
Scampton, John 1870
Sculthorpe, William 1886
Simmons, James 1885
Simpson, J. Woodhouse ... 1886
Simpson, Larrat 1889
Simpson, William 1877
Sloane, John, M.D, ... 1883
Spencer, Charles Alfred ... 1884
Spencer, Thomas 1890
Spencer, William 1883
Spencer, William A. 1890
Squires, Miss Augusta 1887
Stafford, John 1852
Stanion, Oliver Bown 1889
Stanyon, William 1874
Stevenson, George 1844
Stevenson, George Frederick ... 1883
Stocks, Rev. Jno. Edward, M.A. 1889
Strangways, C. Fox 1889
Stretton, Clement *(deceased)* ... 1850
Stretton, Clement Edwin ... 1886
Swain, Robert Paddy 1879
Tait, James 1873
Taylor, Richard... 1889
Taylor, Thomas Smithies ... 1886
Taylor, William... 1886
Thompson, William Thomas ... 1881
Thorp, John T. 1870
Tindall, William Henry ... 1888
Toller, George 1889
Toller, Richard 1835
Toller, Richard Seddon ... 1886
Tomkins, Henry, M.D. ... 1885
Toone, Joseph 1879
Tucker, Charlton 1890
Turner, Alfred 1889
Turner, Miss A.... 1890
Turner, William Henry ... 1881
Vaughan, Rev. David J., M.A. 1860
Viccars, George Herbert ... 1878
Viccars, Mrs. George 1890
Viccars, William Purden ... 1885
Vice, John Henry 1885
Vice, William Armston .. 1880
Vipan, James Vipan 1885
Wakerley, Arthur 1889
Walker, Theodore 1869
Walters, J. T. 1890
Wand, Stephen 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Waring, John Barker 1889
Wartnaby, John Wade... ... 1876
Wates, Benjamin Cunningham 1877
Watson, Edward 1889
Went, Rev. James, M.A. ... 1877
Whitehead, Henry 1872
Whitmore, Charles Edward ... 1890
Willby, Mrs. 1888
Willcox, Samuel 1879
Williams, John Heath... ... 1854
Williams, William Maurice ... 1889
Wilson, Alfred Widnell ... 1882
Windley, Thomas 1890
Winterton, William 1854
Winterton, William Henry ... 1879
Wood, Edward 1889
Wooding, George 1872
Woodruffe, Rev. Jno. Nun Blacker, M.A. 1889
Woolston, Richard 1871
Wright, Thomas 1886
Wright, Thomas Harry ... 1889
Wright, William 1881
Wykes, Alfred 1878
Wykes, Arthur Boud 1885

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ASSOCIATES.

Ashwell, Frank...	1889	Hopps, J. Alfred	1890
Atkins, William(*MarketHarboro'*)	1887	Hottinger, Miss...	1874
Bellairs, Geo. C.	1890	Jones, Miss Rose Evelyn ...	1886
Broadbent, Reginald, M.D. ...	1890	Lewitt, Miss A.	1877
Broadbent, Stanley	1890	Lewitt, Frederick William ...	1889
Cartwright, Mrs. James ...	1876	Lilley, Samuel John	1887
Crossley, Miss L.	1889	Payne, Miss Caroline Edith ...	1882
Edmonds, Thomas	1890	Payne, Miss Eva	1882
Ellis, Bernard	1888	Sandford, Rev. Folliott, M.A....	1889
Francis, Mrs.	1889	Sharland, Thomas	1889
Freer, William Jesse	1889	Smith, James	1889
Freers, Miss M..	1889	Stevens, William Henry ...	1890
Froane, Miss H.	1876	Stevenson, Miss E.	1889
Green, Miss	1883	Stone, Miss E.	1889
Haymes, Mrs.	1874	Warren, Miss	1889
Herne, Frank Shakespeare ...	1890	Whitworth, C H.	1890

HONORARY MEMBERS.

G. A. K. Wilkes, M.D.	
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham*	1847
John Lawrence, *Elton, Peterborough*	1843
C. Liddell, C.E. *London*	1848
John Smeeton, *London*	
C. Roach Smith F.S.A., *S'rood, Kent*	1853
John Rae, M.D., LL.D , *Hudson's Bay House, London*	1854
Major-General The Hon. Leicester Smythe, C.B. (formally Curzon)	1855
James Hemming Webb, *Melbourne, Victoria*	1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London*	1861
Walter H. Bates, *London*	1861
John Halford, *Cape of Good Hope*	1866
Rev. R. Harley, F.R.S,, F.R.A.S., *4, Wellington Square, Oxford*	1874
Rev. C. C. Coe, F.R.G.S., *Bolton*	1874
Rev. J. Spittal, M.A., *Haywood Rectory, Manchester*	1874
Rev. A. MacKennal, B.A., D.D., *Bowden, Manchester*	1877
Rev. W. Romanis, M.A., *Twyford, near Winchester*	1879
Rev. J. P. O Tomkins, B.A., *Kilby, Leicestershire*	1885
Alfred Paget, J.P., *Leicester*	1887

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Report of the Council.

THE present Annual Report of the Council records the proceedings of the Society during its FIFTY-SIXTH Session.

The Council are glad to be able to report that the Session has been a prosperous one. The number of Members has increased, and so has the attendance at the Lectures. The Balance Sheet is satisfactory, and, finally, the past Session has at last brought the Society within sight of the additional accommodation which it has so long needed.

ROLL OF MEMBERS.

Subscribing Members, 1889-90		294	
Lost by Death		5	
„ Removal		4	
„ Resignation		18—27	
		267	
New Elections during the Session—Gentlemen ...		26	
Ladies ...		10—36	
Subscribing Members, 1890-91		...	303
Associates, 1889-90		32	
Lost by Death		1	
„ Resignation		8—9	
		23	
New Elections during the Session		9	
Associates, 1890-91			32
Total Subscribing Members and Associates, 1890-91 ...		...	335
Honorary Members, 1890-91		...	20
Total		...	355

GENERAL MEETINGS.

Twelve General Meetings of the Society have been held during the Session, at which six professional and six non-professional Lectures have been delivered. SIR W. W. HUNTER'S Lecture was given in the Temperance Hall, when upwards of 100 persons were admitted free of charge; all the others were given in the Museum Lecture Hall. The

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Inaugural Address of the PRESIDENT and abstracts of the Lectures have been published in the Society's Transactions.

The Programme of the General Meetings was as follows:—

1890.

Oct. 6.—Inaugural Address of the President (F. T. MOTT, Esq., F.R.G.S.), "Culture."

,, 20.—WHITWORTH WALLIS, Esq., F.S.A., F.R.G.S. (Director of the City of Birmingham Museum and Art Gallery). "Pompeii" (Illustrated).

Nov. 3.—HERR SCHMIDT. "Felix Mendelsohn Bartholdy" (with Illustrations).

,, 17.—Professor H. MARSHALL WARD, M.A., F.R.S., F.L.S. (Professor of Botany in the Royal Indian Civil Engineering College, Cooper's Hill, Egham). "Green Leaves" (Illustrated).

Dec. 1.—The Right Rev. BISHOP MITCHINSON. "Plant Distribution in Great Britain."

,, 15.—HOWARD S. PEARSON, Esq. (Lecturer in English Literature and History at the Birmingham and Midland Institute). "The Days of Good Queen Anne" (Illustrated).

1891.

Jan. 12.—Sir WILLIAM WILSON HUNTER, K.C.S.I., C.I.E., M.A. (Oxon), LL.D. (Cantab). "The New Leaven in India."

,, 26.—Rev. P. T. FORSYTH, M.A. "Tennyson's Idylls in their Epic Unity."

Feb. 9.—Professor RAPHAEL MELDOLA, F.R.S., F.R.A.S., F.C.S., F.I.J.C. (Professor of Chemistry in the Finsbury Technical College, City and Guilds of London Institute). "Coal Products: a Romance of Applied Chemistry" (Illustrated).

,, 23.—A. H. PAGET, Esq. Recital from "Twelfth Night."

Mar. 9.—Professor OLIVER LODGE, D.Sc., LL.D., F.R.S. (Professor of Physics in University College, Liverpool). "Electrical Waves" (Illustrated).

,, 23.—BERNARD DE LISLE, Esq., B.A. "The Drama as a Means of Education."

The average attendance at the Professional Lectures has been 351; at the non-Professional, 333. The average attendance at all the Lectures of the Session has thus been 342, an increase of 11 upon the average ttendance of the previous Session, and an increase of no less than 105 upon the average attendance of the Session 1888-89. The average attendance at the non-Professional Lectures, it may be noted, shows an increase of 53, the Professional Lecturers having this year attracted only 18 more persons on the average than the non-Professional. When allowance is made for a distribution of free passes at some of the Professional Lectures, there remains hardly any difference between the numbers of the audiences at paid and unpaid Lectures.

THE SECTIONS.

The attention of those in the town and neighbourhood of Leicester who are interested in any special branch of study, is particularly directed to the Sections established by the Society for the pursuit of various

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branches of Science, Literature, and Art. Any Section can be joined by a Member or Associate of the Society upon payment of the small yearly subscription of one shilling. But the Council wish to make known as widely as possible that these Sections are not confined to the constituents of the Society. Any person, not a Member or Associate of the Society, can be elected to any Section as a Sectional Associate, with full privileges, paying an annual subscription of half a-crown. Applications should be sent to the Secretaries of the Sections. The Council have power to establish any new Section upon the application of any six Members or Associates of the Society. Sections have been appointed for the study of—

1. Archæology.
2. Fine Arts.
3. Meteorology.
4. Astronomy, Chemistry and Physics.
5. Geology.
6. Numismatics.
7. Zoology.
8. Microscope.

The Sections as at present established are the following:—

A—For Archæology, Literature and Economics.

Secretary, Mr. Frank S. Herne,
Permanent Library.

Forty-two Members, 11 of whom are Sectional Associates. Will meet on the third Tuesday in each month during the Session; commencing October, 1891, in the New Council Room, Museum Buildings.

D—For Biology (Zoology and Botany).

Secretary, Mr. J. J. W. Knowles,
25, St. Stephen's Road.

Forty-one Members, 22 of whom are Sectional Associates. Evening Meetings, the third Wednesday in each month, at 7 p.m., in the New Council Room, Museum Buildings. Field Days, the second Wednesday in each summer month, at 3 or 4 p.m.

E—For Zoology and Geology.

Secretary, Mr. F. R. Rowley,
Town Museum.

Forty-four Members, of whom 29 are Sectional Associates. Evening Meetings, the third Monday in each month, at the New Council Room, Museum Buildings. Field Days, as announced.

Some evidence of the useful work which is being done by the three Sections is furnished by the numerous Papers which they have contri-

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buted to the Transactions during the past Session. These Papers have fully maintained the average standard of previous years. The Council have made small grants this Session to each of the Sections for the purpose of enabling them to obtain scientific periodicals for circulation amongst their members. If the experiment is successful, it is hoped that the grants will be repeated next Session. These periodicals, after circulating amongst the Members of the Section providing them, and amongst the Members of other Sections wishing to see them, will be placed in the Society's Library for the general use of the Members of the Society.

THE TRANSACTIONS.

Four instalments of the New Quarterly Series of Transactions have been published during the past year, being Nos. 4, 5, 6 and 7 of the Second Volume. The Council are glad to find that there is a plentiful supply of good material for each quarter's publication, and note with satisfaction the development of the Series, the number of pages printed in the last four years being as follows :—

In 1887-88	...	119 pages.
1888-89	...	146 „
1889-90	...	188 „
1890-91	...	204 „

The quality of the contents does not appear to have suffered by this extension, and so long as this can be said the Council will gladly welcome the growth of the publication.

The Transactions are presented gratis to every Member and Associate of the Society ; the price to others is 6d. a number. Among the scientific Papers published during the past year, many of them illustrated, may be mentioned the following :—

"Notes on the Great Salina in the Argentine Republic," by the Rev. A. L. SPARKES, M.A., B.Sc.

"On the Teaching of Botany," by Miss HOTTINGER.

"On Vernation and Æstivation," by the Rev. T. A. PRESTON, M.A.

"On the Development of Museums as Public Educators," by F. T. MOTT, F.R.G.S.

"Revision of a Genus of Fossil Fishes—*Dapedius*," by MONTAGU BROWNE, F.Z.S., F.G.S.

"Micro-Organisms in their Relation to the Higher Animals," by Dr. F. M. POPE.

"Weeds," by F. T. MOTT. F.R.G.S.

"The Value of the Poetic Spirit to the Scientific Worker," by the Rev. W. AGAR.

"Notes on the Genus Gentiana, *Linn*," by the Rev. T. A. PRESTON, M.A.

"A List of the Macro-Lepidoptera of Leicestershire," by Messrs. F. BOUSKELL and C. B. HEADLY.

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The literary Papers published during the year include the following:—

"On the Elizabethan Playhouses," by A. H. Paget.

"The Study of Philosophy," by A. P. Moore, B.C.L.

"The Scriblerus Club," by C. J. Billson, M.A.

ACCOMMODATION OF THE SOCIETY.

The Council are glad to report that the expectation held out by them in last year's Report that this recurring difficulty would be settled before the commencement of another Session, is likely to be realised. Plans for the proposed extension of the Museum Buildings, so far as they related to the Society, were approved by your Council in July last, and the work having been sanctioned by the Town Council is now in progress. The additional accommodation gained will be a new room, reserved for the exclusive use of the Society, situated on the left-hand side of a corridor opening out of Princess Street. The dimensions of this room are 33 feet 6 inches by 23 feet, giving an area more than double that of the old room in the Museum which was previously shared by the Society with the Museum officials. From the corridor steps will lead up to the present ante-room, the size of which will be slightly reduced. The new room will provide accommodation for the meetings of the Council and of the Sections, and will afford space for the Library and other belongings of the Society, which are at present very much scattered.

Considerable additions to the Lecture Hall, which are now in progress on the Princess Street side, will be used for the purposes of the Art Gallery, and will contain the cases of exhibits from South Kensington which now crowd the Lecture Hall. At the same time the ventilation of the Hall will be considerably improved.

The Society will continue to pay to the Corporation the same rent as before, viz.: £75 a year; and the only outlay required will be the furnishing of the new room, at a cost of about £100.

Your Council are of opinion that the proposed new accommodation will restore to the Society the privileges for which they have continued to pay rent for so many years, upon their old understanding with the Corporation, although many of these privileges had been actually lost.

PRESERVATION OF ANCIENT BUILDINGS.

Resolutions have been passed by your Council, and forwarded to the Leicester Town and County Councils as the proper guardians of our ancient buildings, strongly deprecating any interference by the proposed new line of Railway with the Castle, Newarke Gateways, Jewry Wall, Roman Pavement, and other historic remains. Although the Bill lately before the House of Commons was thrown out in Committee, it is understood

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that another Bill, having, so far as Leicester is concerned, the same objects, will be introduced next year, and watchfulness is still needed to secure the preservation of these ancient buildings.

MIDLAND UNION OF NATURAL HISTORY SOCIETIES.

By the invitation of the Council, this Union held their Thirteenth Annual Meeting at Leicester on Thursday and Friday, the 18th and 19th September, 1890. Thursday's proceedings included visits to places of interest in the town and the Annual Meeting of the Union, held in the Belvoir Street Schoolrooms, when the President of the Union (Mr. F. T. Mott, F.R.G.S.) delivered his inaugural address on "Organic Death." In the evening a Conversazione was held at the Museum, which was well attended in spite of bad weather. Many interesting objects were exhibited and the programme included a short address by the Rev. E. Jones on the Neolithic remains discovered by him in the Elbolton Cave, near Skipton, a short address by Mr. Egbert de Hamel on "Beavers," and recitations by the Edison phonograph. The programme of the second day consisted of excursions to Charnwood Forest. The party was divided into a botanical and a geological section, the former of whom drove to Swithland, Woodhouse Eaves and Ulverscroft Priory, while the latter proceeded by way of Mountsorrel, Loughborough, and Longcliffe, walking over Ives' Head to the Forest Rock. Both sections met at Newtown Linford at five o'clock, when a meat tea was served. The financial result of the Meeting was a loss to the Society of £39 2s. 9d. At the previous visit of the Union in 1879 the loss had been £32 0s. 9d. It is to be regretted that there were so few visitors to Leicester from the various societies included in the Union, there being only about a dozen present, while in 1879 there were over 30.

PRESIDENTS' PORTRAITS.

Steps have been taken during the past Session to complete the series of portraits of the Presidents of the Society. Before the present series of oil portraits, there were twenty portraits in chalk or water-colours over photographs. Two of these have been already repainted in oil, but of the remaining eighteen all but three are in a very faded state. The Council have arranged for Messrs. J. Burton & Sons to reproduce these old portraits in platinotype and to frame them in dark wood, and five of these reproductions will be completed this year.

HONORARY MEMBER.

The Council have unanimously elected as an Honorary Member Mr. William Kelly, F.S.A., who has been connected with the Society since the year 1837.

NEW PRESIDENT.

The Council have unanimously elected Mr. Robert Harvey, LL.B., President for the ensuing Session.

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Leicester Literary and Philosophical Society—Statement of Accounts.—Session 1890-1891.

Dr. *RECEIPTS.* *Cr.*

	£ s. d.	£ s. d.
To Balance in Treasurer's hands =		
General Fund	64 14 6	
Boulder Fund	4 0 0	
		68 14 6
,, Members' Subscriptions		320 5 0
,, Associates' ,, ...		17 6 6
,, Sale of Tickets in connection with the Meetings and Excursions of the Midland Union of Natural History Societies —September 18-19, 1890		48 3 6

Midland Union Meetings Account.

Receipts.	£ s. d.	*Payments.*	£ s. d.
To Sale of Tickets	48 3 6	By Expenses	87 6 3
,, Balance ...	39 2 9		
	87 6 3		87 6 3

Examined and found Correct, June 11th, 1891.

E. CLEPHAN.
T. C. LEE.

PAYMENTS.

	£ s. d.	£ s. d.
By Rent of Rooms at Museum		75 0 0
,, Expenses connected with Lectures at the Society's Meetings :—		
Lecturers' Fees	68 2 0	
Incidentals connected with Lectures ...	10 10 0	
		78 12 0
,, Subscriptions :—		
Midland Union Natural Hist. Societies'	3 13 6	
Scottish Meteorological Society ...	0 10 6	
Year Book of Societies'	0 7 6	
		4 11 6
,, Grants :—		
To Section "A."	4 0 0	
,, ,, "D."	4 0 0	
,, ,, "E."	7 0 0	
		15 0 0
,, Printing and Stationery		82 19 3
,, Advertising		18 3 6
,, Presidents' Portraits		6 6 0
,, Expenses connected with Meetings and Excursions of Midland Union of Nat. Hist. Societies'—Sept. 18-19, 1890 ...		87 6 3
,, John Carpenter		8 2 6
,, Collecting Subscriptions		10 0 0
,, John Biggs, gratuity		4 4 0
,, ,, Delivery of Circulars ...		2 10 0
,, Miscellaneous Expenses...		9 7 3
,, Balance in Treasurer's hands—		
General Fund	48 7 3	
Boulder Fund	4 0 0	
		52 7 3
	£454 9 6	£454 9 6

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Officers of the Sections.—1890-91.

:o:

SECTION "A." ... ... MR. WM. SIMPSON, CHAIRMAN,
1, Brighton Villas, Princess Street.

MR. JOHN SCAMPTON, SECRETARY,
1, Pelham Street, Welford Road.

SECTION "D." ... ... REV. T. A. PRESTON, CHAIRMAN,
Thurcaston Rectory.

MR. J. J. W. KNOWLES, SECRETARY,
25, St. Stephen's Road.

SECTION "E." ... ... MR. F. M. POPE, M.B., CHAIRMAN,
Campbell House, London Road.

MR. F. R. ROWLEY, SECRETARY,
Town Museum.

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Officers of the Sections.—1891-92.

—:o:—

SECTION "A." ... ... Mr. J. M. GIMSON, Chairman,
100, New Walk.

Mr. F. S. HERNE, Secretary,
Permanent Library.

SECTION "D." ... ... Rev. T. A. PRESTON, Chairman,
Thurcaston Rectory.

Mr. J. J. W. KNOWLES, Secretary,
25, St. Stephen's Road.

SECTION "E." ... ... Mr. MONTAGU BROWNE, Chairman,
Town Museum.

Mr. F. R. ROWLEY, Secretary,
Town Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

FOR ARCHÆOLOGY, LITERATURE, AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—WILLIAM SIMPSON, 1, Brighton Villas, Princess Street.

Secretary—JOHN SCAMPTON, 1, Pelham Street.

Members.	*Sectional Associates.*
BENNETT, A. H., LL.B.	BILLSON, Mrs. C. J.
BILLSON, C. J., M.A.	BILLSON, Miss C.
BROADBENT, STANLEY	ELLIS, Miss H.
BURDETT, F.	HARPER, Mrs. G. P.
CARTER, T., LL.B.	HARPER-VERNON, Miss
COOPER, E. F.	HARVEY, Mrs. R.
ATKINS, A. F.	HAYES, Miss E. A.
BROWNE, M., F.Z.S.	SQUIRES, Miss A.
FRANKLIN, G. B.	STANYON, Miss L.
GARNAR, J. H.	TAYLOR, T. S.
GIMSON, S. J.	TAYLOR, W.
GIMSON, J. M.	
HARPER, G. P., M.A.	
HARVEY, J.	
HARVEY, R., LL.B.	
HERNE, F. S.	
ISLIP, Mrs.	
JACKSON, WILLIAM	
HOPPS, J. A.	
KELLY, W., F.S.A.	
KIRWAN, G. P., M.A.	
LEE, T. C.	
MOTT, F. T., F.R.G.S.	
MOORE, A. P., M.A.	
PAGET, A. H.	
PAUL, J. D., F.G.S.	
ROLLESTON, J. F. L.	
STEVENSON, G. F.	
SIMPSON, WILLIAM	
SCAMPTON, JOHN	

There have been six Meetings of the Section held, the average attendance being eleven Members.

Mr. S. J. GIMSON has been elected a Member.

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The following Papers have been read :—

October 21, 1890. The CHAIRMAN'S Inaugural Address was "*The Future of Political Economy.*"

November 18, 1890. Mr. A. H. PAGET read a Paper on "*Elizabethan Playhouses*" (published in the Transactions).

December 16, 1890. Mr. R. HARVEY, LL.B., on "*George Borrow.*"

January 20, 1891. Mr. T. CARTER, LL.B., on "*Elizabethan Music.*"

February 17, 1891. Mr. C. J. BILLSON, M.A., on "*The Scriblerus Club*" (printed in the Transactions).

March 17, 1891. Mr. A. P. MOORE, M.A., on "*The Study of Philosophy*" (printed in the Transactions).

The Council having voted the sum of £4 for the supply of magazines to the Section, it was resolved that the following be taken :—"The Antiquary," "Economic Review," "Folk Lore," "The Forum," "Journal of Economics," "Notes and Queries," "Leicestershire Notes and Queries."

Mr. J. M. GIMSON was elected Chairman of the Section for the ensuing Session, and Mr. F. S. HERNE (Permanent Library) was elected Secretary.

W. SIMPSON, *Chairman.*

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REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY & BOTANY).

1890-91.

Roll of Members and Sectional Associates.

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston Rectory, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

Members.	*Sectional Associates.*
BARFOOT, W.	ADDERLEY, Miss
BILLSON, C. J., M.A.	AGAR, Rev. W.
BURFORD, S.	BATES, F.
CARTER, T., LL.B.	BOLUS, Miss
COOPER, E. F., F.L.S.	BOUSKELL, F.
COOPER, C. W., M.B.	BURN, J.
FINCH, J. E. M., M.D.	CLEMENTS, R. N., L.R.C.P.
GARNER, J. H.	CHARTERS, Mrs. R.
GRUNDY, W. E.	ELLIOTT, O. T.
HOTTINGER, Miss	GILBERT, F.
MOTT, F. T., F.R.G.S.	GRUNDY, Miss
OVERTON, R.	HEADLY, C. B.
THORP, J. T.	JOHNSON, Miss
TOMPKINS, H., M.D.	MOSS, W.
TURNER, C. G.	MOTT, Mrs.
VICE, W. A., M.B.	NOBLE, Miss
WARREN, Miss	QUILTER, H. E.
	SHENTON, Miss
	STORER, G. H.
	TIBBITTS, Rev. F., M.A.
	WATCHORN, T.
	WHITINGHAM, Rev. W. G., M.A.

Members, 41; viz.:—Members of the Society, 19; non-members, 22. Six members have left during the year, and seven new members have been elected, making an increase of one.

Evening Meetings:—The third Wednesday in each month, at 7 p.m., in the Museum.

Field Days:—The second Wednesday in each summer month, at 3 to 4 p.m.

During the past year the Section has held ten evening meetings, with an average attendance of fifteen members; viz.:—ten gentlemen and five ladies; the maximum number being twenty, and the minimum nine.

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The following Papers have been read and discussed :—

June, 1890.	*An analysis of Henslow's "Origin of Floral Structures,"* by the CHAIRMAN.
July.	*"The Leicestershire Grasses,"* by Dr. FINCH.
November.	*"An Account of the Kew Herbarium,"* by the CHAIRMAN.
December.	*"Weeds,"* by Mr. MOTT.
Jan., 1891.	*"Gentians,"* by the CHAIRMAN.
February.	*"On the Value of the Poetic Spirit to the Scientific Worker,"* by the Rev. W. AGAR.
March.	*"On Heredity,"* by Mr. CARTER.
April.	*"On Certain Macro-Lepidoptera, found in Leicestershire."* by Messrs. BOUSKELL and HEADLY.
May.	*"On Chlorophyll,"* by Mr. MOTT.

The Meeting for September was postponed, as the room was required for the Meeting of the Midland Union of Natural History Societies, which, this year, was held in Leicester. On account of the absence of the CHAIRMAN, who was to have read the Paper, the Meeting in October was devoted to a discussion on the Formation of Legumes and the Growth of the Monkey Nut, led by Mr. MOTT. As discussions have formed of late a special feature of the Meetings, it has been decided that the Paper for the evening shall begin at 7-30; further discussions and exhibitions being deferred till the Paper and its discussion have been finished.

Discussions on the portions of the works appointed to be read by the members of the Home Reading Union, have partly supplied the place of the exhibition of special objects; nevertheless the objects brought for exhibition have been numerous and of much interest. In addition to a considerable number of Fresh Flowers, collections of Woods, Grasses, Preserved Caterpillars, Lepidoptera, and Dried Plants, have been brought by different members.

In consequence of the very unfavourable weather, only one excursion was made in 1890, and one in 1891. The former was to Great Stretton, on October 8th, for a Fungus Foray, at the kind invitation of CHARLES PACKE, Esq.; the latter was to the Abbey Park, instead of to Sileby, as originally intended.

The most noteworthy events in the history of the Section, during the past year, have been: (1) The circulation among the members of certain Periodicals, supplied partly by the Society and partly by the Section. (2) The commencement of a Herbarium to illustrate the Flora of Leicestershire, published by the Society. The aims and plan of the Herbarium are given in detail below. (3) The substitution of a discussion for a Paper on some occasions. This is an endeavour to make the work of the Section of more general interest than at present.

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The same Chairman and Secretary have been elected to serve for the ensuing year.

The new room in the Museum will, it is confidently expected, greatly conduce to the increased activity of the Section, and its usefulness for the purposes of the Society.

T. A. PRESTON, *Chairman.*

REPORT OF SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—F. M. POPE, B.A., M.B., Campbell House.

Vice-Chairman—MONTAGU BROWNE, F.Z.S., F.G.S., Town Museum.

Secretary—F. R. ROWLEY, Town Museum.

Members.

ANDERSON, J. S.
BATES, E. F.
BOND, C. J., F.R.C.S.
CLEMENTS, R. N., L.R.C.P.
DRAPER, A. T.
HARVEY, R., LL.B.
MOORE, C. A., M.D.
PATTISON, E.
PAUL, J. D., F.G.S.
PAYNE, Miss C. E.
RUST, A.
SQUIRES, Miss A.
STRANGWAYS, C. FOX, F.G.S.
VICE, W. A., M.B.
WALKER, T.

Associates.

BAKER, A. E.
BOUSKELL, F.
BROWN, T.
BURCHNALL, W.
BURROWS, T.
DAVIES, J. T., M.D.
EDGE, Miss
ELLIOTT, O. T.
EVANS, W. A.
HAYES, Miss E. A.
HEADLY, B.
HODGES, L.
HOW, F. F.
HOWITT, H.
LANCASTER, Rev. R. W., M.A.
LAWRENCE, J.
LEWITT, B.
MACAULAY, T., M.R.C.S.L.
MACLACHLAN, G.
MATTHEWS, Rev. A., M.A.
MOORE, E.
PALMER, J.
PARR, J. G., M.R.C.V.S.
PYCRAFT, W. P.
QUILTER, H. E.
SPARKES, Rev. A. L., M.A., B.Sc.
SQUIRES, Miss
STORER, G. H.
WARD, G.

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Seven Associates have resigned during the past year, while five new ones have been elected, thus making a total of 47 at present on the roll.

On August 9th an excursion was arranged to Barrow-on-Soar, for the purpose of inspecting the well-known lias exposures at Messrs. ELLIS's Lime Works. The various geological features were explained by the VICE-CHAIRMAN, who acted as leader. Through the kindness of Mr. W. J. WOOLLEY, the party was also enabled to inspect the grounds at Barrow Cliff.

The evening meetings of the Section have been well attended, and much interesting material for discussion has been provided in the shape of both Papers and Exhibits. It is anticipated that as soon as the new room, now in process of erection for the use of the Society generally, is ready for occupation, the sphere of usefulness of the Section will be much enlarged, the present accommodation being ill-adapted for the wants of a growing body such as ours.

In January last the Council of the Society intimated their willingness to grant a sum of money to each of the Sections in order to enable them to purchase periodicals, devoted to special branches of study, for circulation amongst the members. This Section applied for and obtained a grant of £7, and, up to the present, the following magazines have been subscribed for—viz.: "Nature," "The Quarterly Journal of Microscopical Science," "The Ibis," "The Geological Magazine," "The Entomologists' Monthly Magazine," "The Conchological Journal," and "The Conchologist"; Mr. W. A. VICE kindly lends his copy of "Science Gossip" monthly. The scheme, which is now working very smoothly, has been found of great practical utility in all the departments of Sectional work.

The following Papers and short communications have been read at the evening meetings of the Section—viz :—

July 7, 1890. "*On some recent Excavations in the neighbourhood of the Spinney Hills*," by the VICE-CHAIRMAN.

"*Notes on Lord Ilchester's Swannery, near Weymouth*," by Mr. F. F. How. (Illustrated.)

September 8. "*South America and its Peoples*," by the Rev. A. L. SPARKES, M.A., B.Sc. (Illustrated.)

October 13. "*Some Notes on the Palæontology of the Leicestershire Lias*," by Mr. H. E. QUILTER.

November 10. "*Micro-Organisms, and their Relations to the Higher Animals*," by the CHAIRMAN.

December 8. "*Notes on Australian Bird Life*," communicated by Mr. F. F. How. (Illustrated.)

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January 19, 1891. "*Notes on some Malformations of the Bill in Birds*," by Mr. W. P. PYCRAFT. (Illustrated.)

February 16. "*A Preliminary List of Leicestershire Macro-Lepidoptera*," by Messrs. F. BOUSKELL and C. B. HEADLY. (Illustrated)

"*On a Sea Pen (Pennatula)*," by the SECRETARY. (Illustrated.)

March 16. "*The Geology of the Keuper in the vicinity of Leicester*," by the VICE-CHAIRMAN. (Illustrated.)

April 13. "*Some Internal Parasites of the Domestic Animals*," by Mr. J. G. PARR, M.R.C.V.S. (Illustrated.)

May 11. "*Notes on the Fauna of the North West Territory*," by Mr. W. A. EVANS. (Illustrated.)

F. M. POPE, *Chairman.*

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RULES OF THE LEICESTER
LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Object. The object of the Society shall be the general cultivation of Literature, Science and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality, a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meeting, in conformity

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with Rule I. The discussion of theological or political questions, either by Lecturers or Speakers is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately destroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Sections, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next meeting of the Council, and submitted for election at a subsequent Meeting. All such elections shall be announced at the ordinary meeting of the Society next ensuing.

IX.

Subscriptions.

Each Member shall pay an annual subscription of one Guinea, which shall entitle him (1) to a Member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII.

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors.

Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentleman resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations.

Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds.

After payment of the expenses of the Society, any surplus Funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alterations of Rules.

No rule shall be made, rescinded, or altered, without the consent of two thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-laws, &c.

The Council shall have power to make By-laws and Regulations not inconsistent with the foregoing Rules.

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By-Laws.

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council on the 4th of November, 1857, adopted the following By-laws in the place of those then existing.

1.—Any Member or Associate of the Society may join any Section upon giving his or her name to the Secretary of that Section, and paying to its funds an Annual Subscription of 1/-.

2.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2/6 to the funds of such Section.

3.—Each Section shall elect annually a Chairman and Secretary. The Chairman shall be a Member of the Society.

4.—For Sectional purposes the year shall terminate on the 31st of May, and the Annual Election of Officers by each Section shall take place at the Meeting of the Section next preceding that date. Casual vacancies shall be filled up as they occur by the Sections respectively. All Elections of Sectional Officers shall be reported to the next ensuing Meeting of the Council.

5.—Each Section shall, on or before the first Friday in March, June, September, and December, present to the Council, a Quarterly Report of its Transactions and a Statement of the Meetings to be held during the ensuing quarter, which, subject to the approval of the Council, shall be published in the Quarterly Transactions of the Society. Each Section shall, if practicable, at the same time present to the Council at least one paper *in extenso* read before that Section, and the Council may direct that any such paper shall be printed in the Quarterly Transactions of the Society, with all necessary illustrations, in such form and manner as the Chairman of the Section shall recommend.

6.—The Quarterly Report of each Section, presented on or before the first Friday in June and published in the July number of the Tansactions, shall be made up to the 31st of May, and shall contain in addition to the Quarterly Transactions of the Sections, the Roll of Members, the names of the Officers of the past year, and of those elected for the ensuing year, and an abstract of the work of the Section during the past twelve months.

7.—The Council may, on the application of any Section, make grants of money for any object connected with the work of the Sections.

8.—Any six Members or Associates of the Society who desire the establishment of a new Section, may memorialize the Council to that effect, but no Section shall be established without the consent of the Council.

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ANNUAL REPORTS

OF THE

LEICESTER

Literary & Philosophical Society.

FIFTY-SEVENTH SESSION.

1891—92.

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OFFICERS OF THE SOCIETY FOR THE PAST SESSION, 1891-92.

President :

R. HARVEY, Esq., LL.B.

Vice-Presidents :

F. T. MOTT, F.R.G.S.
J. D. PAUL, F.G.S.
E. F. COOPER, F.L.S.
GEORGE STEVENSON.

Council :

Retiring June, 1892.	Retiring June, 1893.
C. J. BOND, F.R.C.S.	C. J. BILLSON, M.A.
C. W. COOPER, M.B.	H. BILLSON.
HERBERT ELLIS.	A. T. DRAPER.
REV. P. T. FORSYTH, M.A.	J. E. M. FINCH, M.D.
R. HARVEY, LL.B.	G. B. FRANKLIN.
W. KEMPSON.	A. P. MOORE, B.C.L.
J. J. W. KNOWLES.	C A. MOORE, M.D.
T. C. LEE.	A. H. PAGET.
M. L. LEWIS, M.A., LL.M.	JAS. PLANT, F.G.S.
F. M. POPE, M.B	HENRY TOMKINS, M.D.
REV T. A. PRESTON, M.A.	W. P. VICCARS.
REV. J. WENT, M.A.	W. A. VICE, M.B.

Treasurer :

ALFRED PAGET.

Hon. Secretaries :

Corresponding Secretary, J. M. GIMSON.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON.

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OFFICERS OF THE SOCIETY FOR THE PRESENT SESSION, 1892-93.

President:

REV. P. T. FORSYTH, M.A.

Vice-Presidents:

C. J. BILLSON, M.A.
R. HARVEY, LL.B.
F. T. MOTT, F.R.G.S.
G STEVENSON.

Council:

Retiring June, 1893.	Retiring June, 1894.
H. BILLSON.	C. J. BOND, F.R.C.S.
E. F. COOPER, F.L.S.	T. CARTER, LL.B.
A. T. DRAPER.	C. W. COOPER, M.B.
J. E. M. FINCH, M.D.	HERBERT ELLIS.
G. B. FRANKLIN.	J. J. W. KNOWLES.
W. KEMPSON.	T. C. LEE.
G. R. KIRWAN, M.A.	M. L. LEWIS, M.A. LL.M.
A. P. MOORE, B.C.L.	J. D. PAUL, F.G.S.
C. A. MOORE, M.D.	F. M. POPE, M.B.
A. H. PAGET.	REV. T. A. PRESTON, M.A.
W. P. VICCARS.	WILLIAM STANYON.
W. A. VICE, M.B.	REV. J. WENT, M.A.

Treasurer:

ALFRED PAGET.

Hon. Secretaries:

Corresponding Secretary, J. M. GIMSON.
Financial „ GEORGE HULL.
Minute „ W. SIMPSON.

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THE TOWN MUSEUM.

REMAINING TRUSTEES:

Under the old Deed of Transfer from the Society.

THOSE ONLY ARE QUALIFIED TO ACT WHO REMAIN MEMBERS OF THE SOCIETY.

A. PAGET. | S. S. BANKART.

TOWN COUNCIL COMMITTEE:

Fifteen Members of the Council:

MR. BIGGS, CHAIRMAN
ALD. BARFOOT
MR. BOOTH
„ BOWLES
ALD. CLIFTON
MR. ELLIS
ALD. ELSE
MR. JENNINGS
ALD. KEMPSON
MR. LEAVESLEY
„ MOTT
„ ROYCE
„ VINCENT
„ VORLEY
„ WOOLLEY

Ten Gentlemen not Members of the Council:

MR. C. J. BOND, M.D.
„ R. R. BLACKWELL
„ E. F. COOPER, F.L.S.
„ JOSEPH GODDARD
„ THOMAS GROVES
MR. G. H. HODGES
„ A. H. PAGET
„ J. D. PAUL
„ S. J. VICCARS
„ W. A. VICE

HONORARY CURATORS:

ALD. KEMPSON.
J. D. PAUL, F.G.S.
ALF. PAGET.
A. H. PAGET.
H. BILLSON.
A. RUST.

CURATOR:

MONTAGU BROWNE, F.Z.S.

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MEMBERS OF THE SOCIETY DURING THE PAST YEAR.

The date after each name indicates the year of the Member's Election.

Adderly, Alfred... 1873
Allen, Charles Gordon 1886
Almond, Thomas 1870
Aspeil, William Laxton ... 1889
Atkins, Arthur Frederick ... 1878
Atkins, Rev. Edward, B.Sc. ... 1876
Atkins, William (*Market Harborough*) 1891
Bailey, Thomas... 1891
Baines, Alexander 1874
Baines, Miss Elizabeth... ... 1890
Baker, Charles 1861
Barfoot, William 1874
Barlow, Arthur Edward, M.D. 1888
Bassett, Arthur... 1891
Bates, Ernest Frederick ... 1889
Bates, William Henry 1862
Berridge, Alfred 1889
Billson, Charles James, M.A.... 1883
Billson, Henry 1871
Billson, William 1852
Blakesley, Henry John, F.R.C.S. 1890
Boam, Frederick William ... 1890
Bolton, Frederick 1889
Bolus, Arthur 1889
Bond, Charles James, F.R.C.S. 1887
Bond, Miss E. M. 1891
Bowmar, Walter Hammond .. 1890
Bramley, William Forrester ... 1868
Brierly, James L. 1880
Brown, Henry 1886
Brown, Jonathan 1890
Browne, Montagu 1889
Burdett, Fergus... 1888
Burford, Samuel Francis, F.C.S. 1884
Burton, John William 1874
Butler, Edward Henry... ... 1889
Caillard, Ernest... 1889
Carnley, Samuel Birch... ... 1879
Carnley, Walter Firth 1890
Carter, Thomas, LL.B. ... 1872
Cartwright, Mrs. James ... 1891
Challis, Francis James. ... 1877
Chappel, Miss 1889
Charters, Mrs. Robert 1890
Chattaway, John Gordon ... 1880
Clarke, John Webster 1870
Clarke Samuel 1850
Clements, Robert Newton, L.R.C.P. 1885
Clephan, Edwin 1856
Clifton, George, M.D. 1886
Colgrove, John Brice, M.A., (*Loughborough*) 1879
Colson, Alfred 1885
Coltman, Thomas 1872
Cooper, Chas. Wm., M.D. ... 1873
Cooper, Edgar Franklin, F.L.S. 1872
Cooper, John Harris 1885
Cowan, George 1871
Craig, John Thomas, L.D.S. ... 1889
Crofts, John Ephraim 1880
Davis, John Henry 1886
Davis, Samuel 1871
Dawson, Rev. Ambrose Pudsey, M.A. (*Kibworth*) 1878
De Lisle, Bernard (*Whitwick*) 1890
Donisthorpe, Hamilton ... 1886
Draper, Arthur Thomas .. 1879
Dutton, Edmund 1889
Duval, Henry 1890
Eames, Miss 1890
Elgood, George Samuel... ... 1887
Elgood, Thomas Scott 1885
Ellis, Arthur D. 1889
Ellis, Ernest Edward 1879
Ellis, Frederick... 1881
Ellis, Herbert 1886
Ellis, Mrs. G. H. 1891
Ellis, Mrs. James 1886
Ellis, James Bancroft 1891
Ellis, Mrs. J. H. 1886
Ellis, Owen Alfred 1889
Ellis, Robert Henry 1889
Ellis, Theodore Burgess ... 1889
Ellis, Wilfrid Henry 1885
Else, Alfred 1860
Else, Miss Mary Elizabeth ... 1887
Elton, Joseph William... ... 1875
Evans, Arthur 1881
Evans, Thos. Merritt (deceased) 1859
Evans, William... 1858
Everard, John Breedon ... 1870
Ewen, Arthur 1889
Ewing, Henry Frank 1889
Finch, John E Montagu, M.D. 1870

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Firth, Solomon 1889
Fleming, Josiah... 1880
Forsyth, Rev. Peter Taylor, M.A. 1888
Fortescue, Rev. Hugh John, M.A. 1877
Franklin, George Barton ... 1849
Franklin, George Cooper, F.R.C.S. 1891
Gardiner, Charles Laurence ... 1889
Garnar, John Henry 1874
Gee, Harry Simpson 1885
Gibbons, George 1878
Gibbs, Arthur W. 1886
Gimson, Arthur James... ... 1879
Gimson, Josiah 1887
Gimson, Josiah Mentor ... 1872
Gimson, Sydney Ansell ... 1883
Goadby, Mrs. 1890
Goddard, Miss E. A. 1886
Goddard, Joseph 1878
Gordon, Mrs. Joseph 1890
Goward, Rowland Sydney ... 1883
Grant, Walter D. 1890
Green, George 1870
Green, James 1879
Grimsdick, George John (*Kibworth*) 1886
Grundy, Walter Edward ... 1873
Gunn, Thomas James 1874
Hack, Matthew (deceased) ... 1860
Hare, Charles Edward 1891
Harper, George Povey, M.A. .. 1885
Harris, Joseph 1862
Harrison, Stockdale 1889
Hart, Israel 1885
Hart, Joseph 1890
Harvey, Joseph... 1870
Harvey, Robert, LL.B. ... 1877
Hawkes, James 1883
Hewitt, Francis... 1862
Hibbert, George Radford (deceased) 1882
Higgins, William Henry, M.B. 1883
Hincks, James Thorp 1891
Hitchcock, James William ... 1877
Hobson, William Stephen ... 1876
Hodges, Frank Henry 1885
Hodges, George Henry... ... 1860
Hodges, John Edward (deceased) 1860
Holmes, Mrs. John 1891
Hopps, Rev. John Page ... 1876
Howcutt, Miss 1887
Hudson, Alfred 1849
Hull, George 1859
Humberstone, Miss 1890
Hunt, Mrs. William 1886
Ingram, Thomas 1861
Islip, Francis William 1877
Jacques, Edwin 1873
Johnson, Thomas Fielding ... 1852
Johnson, Thomas Fielding, jun. 1880
Jones, George Howell 1874
Jones, Thomas 1884
Kempson, John Flower ... 1891
Kempson, William 1849
Kidney, John 1889
Kilby, Edwin Charles 1885
Kirby, John 1872
Kirwan, George R., M.A. ... 1889
Knowles, Jno. Jas. Worthington 1889
Lakin, Charles, L.R.C.P. ... 1891
Langley, Rev. William, M.A. (*Narborough*) 1890
Lankester, Frank J. 1890
Lawford, James... 1872
Lead, William Henry 1885
Lee, Thomas Cotchett 1862
Leicester, Miss Ellen 1886
Lennard, Samuel 1889
Lewis, Martin Luther, M.A., LL.M. 1888
Lewitt, Frederick William, M.R.C.S. 1891
Livens, Frederick 1874
Lloyd, W. H. 1891
Lockhart, Philip H. 1886
Mackennal, Miss Gertrude ... 1889
Marris, Samuel Arthur... ... 1889
Maxfield, Matthew ... ...
Milne, John 1883
Moore, Alfred Percival, M.A. 1887
Moore, Chas. Arthur, M.D. ... 1883
Moore, Miss C. L. 1891
Mott, Frederick Thompson, F.R.G.S. 1849
Murray, Mrs. J. T. A.... ... 1889
Nevinson, Miss M. E.... ... 1890
Newby, William Thomas ... 1873
Noble, Miss 1888
Oliver, George 1891
Overton, Robert 1885
Packe, Charles, F.L.S. (*Stretton Magna*) 1874
Paget, Alfred Henry 1874
Paget, Mrs. E. H. 1886
Paget, Miss E S. 1889
Patey, Samuel 1890
Pattison, Ernest 1887
Paul, John Dennis, F.G.S. ... 1877
Payne, George 1879
Pegg, Abraham (deceased) ... 1873
Pegg, Charles 1886
Pegg, John 1879
Pickard, Ezra 1885
Plant, James, F.G.S. 1866
Pochin, Robert 1885

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Pollard, William Gamble ... 1885
Pope, Frank Montagu, M.B. ... 1885
Pratt, Reginald, M.D. 1891
Preston, Rev. Thomas Arthur, M.A. (*Thurcaston*) ... 1885
Raven, William... 1886
Redfern, Francis 1889
Rendell, Rev. Arthur Medland, M.A. 1889
Richardson, John George Fredk. 1886
Roberts, Joseph Drayton ... 1879
Roberts, Mrs. R. Y. 1891
Roberts, Thomas 1880
Robinson, Charles Stephen ... 1879
Rowlett, William Tertius ... 1885
Royce, David C., jun. 1881
Royce, George Applebee ... 1890
Russell, Herbert 1886
Rust, Arthur 1871
Rutland, His Grace the Duke of 1888
Sarson, John Edward 1880
Sawday, Albert Edward ... 1891
Scampton, John 1870
Sculthorpe, William 1886
Simmons, James 1885
Simpson, Larrat 1889
Simpson, William 1877
Sloane, John, M.D. (deceased) 1883
Spencer, Charles Alfred ... 1884
Spencer, Thomas 1890
Spencer, William 1883
Spencer, William Aldridge ... 1890
Squires, Miss Augusta 1887
Stafford, John 1852
Stafford, Mrs. S. 1891
Stanion, Oliver Bown 1889
Stanyon, William 1874
Stevens, Wm. Henry 1891
Stevenson, George 1844
Stevenson, Geo. Frederick, LL.B. 1883
Stocks, Rev. Jno. Edward, M.A. 1889
Strangways, C. Fox 1889
Stretton, Mrs. A. 1891
Stretton, Clement Edwin ... 1886
Swain, Robert Paddy 1879
Tait, James 1873
Taylor, Richard... 1889
Taylor, Thomas Smithies ... 1886
Taylor, William 1886
Thew, Rev. James Wilton ... 1891
Thompson, William Thomas ... 1881
Thornton, Joseph 1891
Thorp, John T. 1870
Tindall, William Henry ... 1888
Toller, George 1889
Toller, Richard 1835
Toller, Richard Seddon ... 1886
Tomkins, Henry, M.D. (deceased) 1885
Toone, Joseph 1879
Tuckfield, James 1891
Turner, Alfred 1889
Turner, Miss A.... 1890
Turner, William Henry ... 1881
Tyler, William 1891
Vaughan, Rev. David James, M.A 1860
Viccars, George Herbert ... 1878
Viccars, Mrs. George 1890
Viccars, William Purden ... 1885
Vice, John Henry 1885
Vice, William Armston, L.D.S. 1880
Vipan, James Vipan 1885
Wakerley, Arthur 1889
Walker, Theodore 1869
Walters, John Tudor 1890
Wand, Stephen... 1880
Ward, John Lipson 1886
Ward, Joseph Griffin 1874
Waring, John Barker 1889
Wartnaby, John Wade ... 1876
Wates, Benjamin Cunningham 1877
Went, Rev. James, M.A. ... 1877
Whitehead, Henry 1872
Whitmore, Charles Edward ... 1890
Wilby, Mrs. 1888
Williams, John Heath... ... 1854
Williams, William Maurice ... 1889
Wilshere, Herbert William ... 1891
Wilson, Alfred Widnell ... 1882
Windley, Thomas 1890
Winterton, William 1854
Winterton, William Henry ... 1879
Wood, Edward 1889
Wooding, George 1872
Woodruffe, Rev. John Nun Blacker, M.A. 1889
Woolston, Richard 1871
Wright, Thomas 1886
Wright, Thomas Harry ... 1889
Wright, William 1881
Wykes, Arthur Boud 1885

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ASSOCIATES.

Ashwell, Frank...	1889	Hopps, John Alfred	1890
Bellairs, George C.	1890	Hottinger, Miss...	1874
Broadbent, Reginald, M.D. ...	1890	Lewitt, Miss A.	1877
Broadbent, Stanley	1890	Lilley, Samuel John	1887
Crossley, Miss L.	1889	Nesbit, David M.	1891
Edmonds, Thomas	1890	Oldershaw, Mrs.	1891
Ellis, Bernard	1888	Payne, Miss Caroline Edith ...	1882
Francis, Mrs. Alfred	1889	Payne, Miss Eva	1882
Freer, William Jesse	1889	Sharland, Thomas	1889
Gray, Rev. Charles, M.A. ...	1891	Smith, James	1889
Green, Miss	1883	Stevenson, Miss E.	1889
Haymes, Mrs.	1874	Stone, Miss E.	1889
Herne, Frank Shakespeare ...	1890	Whitworth, C. H.	1890

HONORARY MEMBERS.

G. A. K. Wilkes, M.D.	
Rev. W. Drake, M.A., *Sedgebrooke Rectory, Grantham*	1847
John Lawrence, *Elton, Peterborough*	1843
C. Liddell, C.E., *London*	1848
John Smeeton, *London*	
C. Roach Smith, F.S.A., *Strood, Kent*...	1853
John Rae, M.D., LL.D., *Hudson's Bay House, London*	1854
Major-General The Hon. Leicester Smythe, C B. (formerly Curzon)	1855
James Hemming Webb, *Melbourne, Victoria*	1856
Dr. A. J. Bernays, *St. Thomas's Hospital, London* (deceased) ...	1861
Walter H. Bates, *London* (deceased)	1861
John Halford, *Cape of Good Hope*	1866
Rev. R. Harley, F.R.S., F.R.A.S., *4, Wellington Square, Oxford*	1874
Rev. C. C. Coe, F.R.G.S., *Bolton*	1874
Rev. J. Spittal, M.A., *Haywood Rectory, Manchester*	1874
Rev. A. MacKennal, B.A., D.D., *Bowden, Manchester*	1877
Rev. W. Romanis, M.A., *Twyford, near Winchester*	1879
Rev. J. P. O. Tomkins, B.A., *Kilby, Leicestershire*	1885
Alfred Paget, J P., *Leicester*	1887
William Kelly, F.S.A , *Leicester*	1891

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Report of the Council.

THE Council has pleasure in presenting the Report of the proceedings of the Society during its FIFTY-SEVENTH Session.

During the year the additional buildings at the Museum have been completed, and the Council has thus come into possession of the new room which has been built specially for its accommodation, to be used for meetings of the Council, meetings of the Sections, and for such other purposes as the Society may deem desirable. The room contains the library of the Society, a herbarium (in which are already placed some 600 specimens), microscopes and other instruments for the use of the Sections, and the portraits of the past Presidents are hung upon the walls. The furnishing has been done at the expense of the Society, a large portion of the amount having been met by special subscriptions from the members. The room is open to the inspection of the members.

In addition to this, the cases on loan to the Museum from South Kensington, which have occupied a good deal of space in the lecture room for many years past, have now been removed into another part of the building. This will be a great boon in future sessions, as it has not seldom happened that the accommodation for the audience at the lectures has been insufficient.

A Committee has been formed in connection with Section "A" for collecting and studying the Folk-lore of the neighbourhood. This Committee is affiliated to the Folk-lore Society as their Local Committee for Leicestershire and Rutland, and it is now being organised upon lines recommended by the Organization Committee of the parent Society. A subscription of £3 3s. per annum is paid to the Folk-lore Society (towards which the Council of this Society has made a grant of £1 1s.), and in return the Committee receive nine copies of "Folk-lore," the quarterly review and organ of the Folk-lore Society, and all other publications of the Society. Members can also obtain gratis the Society's excellent "Handbook of Folk-lore." Members of the Committee are now at work collating various local histories, newspapers, &c., with a view to publishing, under the auspices of the parent society, a collection of the printed Folk-lore of the district, similar to a volume of Gloucestershire Folk-lore which has already appeared. It is hoped that next autumn, when the Committee is in working order, a great many new members will join in this useful and interesting work. "Folk-lore" has long since obtained a recognised position among the sciences, and the importance of its results, which was at first questioned, is becoming more and more apparent every year.

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The Folk-lore Society is arranging for local committees in every British county, as well as abroad. Mr. SIDNEY HARTLAND, F.S.A., who attended the inaugural meeting as a deputation from the Council of the Folk-lore Society, congratulated the Leicestershire Committee upon their being the first to take the field, and it is to be hoped that no lack of enthusiasm shall cause them to fall behind other county committees who are entering it later.

ROLL OF MEMBERS.

Subscribing Members, 1890-91		303	
Lost by death	7		
„ removal	5		
„ resignation	22—34		
	269		
New Elections during the Session	28		
Subscribing Members, 1891-2	297		
Associates, 1890-91	32		
Lost by death	1		
„ resignation	8—9		
	23		
New Elections during the Session	3		
	26		
Total Subscribing Members and Associates, 1891-92...		...	323
Honorary Members, 1891-92		...	20
Total ...		...	343

GENERAL MEETINGS.

Twelve general meetings of the Society have been held during the Session, at which six professional and six non-professional lectures have been given. Abstracts of all the lectures, including the inaugural address of the President, have been published in the Quarterly Transactions.

Below is the Programme of the General Meetings:

1891.

October 5.—Inaugural Address of the President (ROBERT HARVEY, Esq., LL.B.).

„ 19.—Rev. AUGUSTUS JESSOPP, D.D. "The Religious Houses of Leicester."

Nov. 2.—The Right Rev. The BISHOP OF PETERBOROUGH. "Sicily."

„ 16.—Sir ROBERT S. BALL (Royal Astronomer of Ireland). "Invisible Stars" (Illustrated).

„ 30.—Mr. J. D. PAUL, F.G.S. "The Ruins in Bradgate Park: their History and Associations" (Illustrated).

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Dec. 14.—Mr. JESSE HERBERT (formerly Legal Adviser to the Chinese Government at Canton). "Life in the Far East."

1892.

January 11.—Mr. CARL ARMBRUSTER. "Franz Schubert, the greatest song composer of all times," with vocal illustrations by Miss CRAMER.

,, 25.—Rev. C. C. COX, F.R.G.S. (of Bolton). "King Lear."

February 8.—Professor A. SMITHELLS (Professor of Chemistry at the Yorkshire College, Leeds). "Ozone."

,, 22.—Dr. ALFRED HARVEY (of Birmingham). "Micro-Organisms and Disease."

March 7.—Professor MATESDORF. "Old Irish and Anglo-Saxon Art."

,, 21.—Mr. A. P. MOORE, B.C.L. "The Universities and National Education."

The average attendance at the professional lectures has been 327; at the non-professional 324; giving an average for the whole of the Session of 325. This is rather less than the average for the last Session, but it should be remembered that the whole of the lectures have been given in the Museum Lecture Room, whilst Sir W. W. HUNTER's lecture on India last Session was given in the Temperance Hall, and a number of free tickets were distributed.

THE SECTIONS.

The Sections have met as usual during the Session, and have done interesting and useful work. Those working at present are as follows:

A—FOR ARCHÆOLOGY, FOLK LORE, LITERATURE, AND ECONOMICS.

Secretary, Mr. F. S. HERNE,
Permanent Library.

46 Members, of whom 13 are Sectional Associates. Meetings—the third Tuesday in each month during the Session, at 7 p.m.

D—For BIOLOGY (ZOOLOGY and BOTANY).

Secretary, Mr. J. J. W. KNOWLES,
25, St. Stephen's Road.

39 Members, 18 of whom are Sectional Associates. Evening Meetings—the third Wednesday in each month, at 7 p.m. Field Days—the second Wednesday in each month, at about 3 p.m.

E—For ZOOLOGY and GEOLOGY.

Secretary, Mr. F. R. ROWLEY,
Town Museum.

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46 Members, 29 of whom are Sectional Associates. Evening Meetings—the third Monday in each month, at 8 p.m. Field Days—as announced.

Several interesting Papers, contributed to the Sections, have been published in the Transactions, and a separate report from each Section, of its doings during the Session, appears in this number.

THE TRANSACTIONS.

The Transactions have been published quarterly as usual, and a copy presented gratis to each Member and Associate of the Society. To outsiders the price is 6d. a number, but the demand for them is very small.

Among the Papers published during the past year, in addition to the abstracts of the General Meetings, are the following:

"The Mental Capacity of Animals," by Mr. F. T. MOTT, F.R.G.S.

"The Abbey Park," by Miss HOTTINGER.

"Cornish Mines and Minerals," by Mr. F. W. BOAM.

"An Edinburgh Review Editor," by Mr. J. M. GIMSON.

"Robert Louis Stevenson," by Mr. C. J. BILLSON.

"Notes on some Malformations of the Bill in Birds," by Mr. W. P. PYCRAFT.

"An English Village in the 13th Century," by Mr. A. H. BENNETT, LL.B.

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Leicester Literary & Philosophical Society-Statement of Accounts.-Session 1891-92.

Dr. **RECEIPTS.**

	£	s.	d.	£	s.	d.
To Balance in Treasurer's hands :—						
General Fund	48	7	3			
Boulder Fund	4	0	0			
				52	7	3
,, Members' Subscriptions				308	3	6
,, Associates' ,, ...				13	13	0
,, Sale of one copy of "Flora of Leicestershire"				0	7	6
,, Sale of Quarterly Transactions				0	8	6
,, Subscriptions to Special Fund for Furnishing the New Council Room ...				83	14	0
				£458	13	9

June 27th, 1892.--The above accounts were this day examined and found correct.

E. CLEPHAN.
T. C. LEE.

PAYMENTS. *Cr.*

	£	s.	d.	£	s.	d.
By Rent of Rooms at Museum				75	0	0
,, Expenses connected with Lectures at the Society's Meetings :—						
,, Lecturers' Fees	75	9	0			
,, Incidentals connected with Lectures ...	6	12	6			
				82	1	6
,, Subscriptions :—						
Midland Union of Nat. Hist. Societies	3	15	9			
Folk Lore Society	1	1	0			
Scottish Meteorological Society ...	0	10	6			
"Glimpses of Ancient Leicester" ...	0	8	6			
Year Book of Societies	0	6	0			
				6	1	9
Grants :—						
To Section "A."	1	4	0			
,, ,, "D."	8	3	0			
,, ,, "E."	2	0	0			
				11	7	0
,, Printing and Stationery				76	15	6
,, Advertising				5	14	6
,, Presidents' Portraits				5	0	0
,, W. Newberry—Carpenter				3	7	6
,, Collecting Subscriptions				10	0	0
,, John Biggs—Gratuity				4	4	0
,, ,, delivery of Circulars ...				1	10	0
,, Miscellaneous Expenses				7	5	6
,, Expenses connected with Furnishing the New Council Room ...				168	2	0
,, Balance in Treasurer's Hands				2	4	6
				£458	13	9

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Officers of the Sections, 1891-92.

———:o:———

SECTION "A." ... ... MR. J. M. GIMSON, CHAIRMAN, 100, New Walk.

MR. F. S. HERNE, SECRETARY, Permanent Library.

SECTION "D." ... ... REV. T. A. PRESTON, CHAIRMAN, Thurcaston Rectory.

MR. J. J. W. KNOWLES, SECRETARY, 25, St. Stephen's Road.

SECTION "E." ... ... MR. MONTAGU BROWNE, CHAIRMAN, Town Museum.

MR. F. R. ROWLEY, SECRETARY, Town Museum.

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Officers of the Sections, 1892-93.

———:o:———

SECTION "A." .. ... MR. C. J. BILLSON, M.A., CHAIRMAN,
St. John's Lodge, Clarendon Park Rd.

MR. F. S. HERNE, SECRETARY,
Permanent Library.

SECTION "D." ... ... REV. T. A. PRESTON, CHAIRMAN,
Thurcaston Rectory.

MR. J. J. W. KNOWLES, SECRETARY,
25, St. Stephen's Road.

SECTION "E." ... REV. R. W. LANCASTER, M.A., CHAIRMAN,
Beaumanor Villas, Aylestone Road.

MR. F. R. ROWLEY, SECRETARY,
Town Museum.

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REPORTS OF SECTIONS.

REPORT OF SECTION "A."

ARCHÆOLOGY, FOLK LORE, LITERATURE AND ECONOMICS.

Roll of Members and Sectional Associates.

Chairman—MR. J. M. GIMSON, 100, New Walk.

Secretary—MR. F. S. HERNE, Permanent Library.

33 Members.

ATKINS, A. F.
BILLSON, C. J., M.A.
BROADBENT, STANLEY
BROWNE, M., F.Z.S.
BURDETT, F.
CARTER, T., LL.B.
CLEMENTS, R. N., L.R.C.P.
COOPER, E. F.
FRANKLIN, G. B.
ELLIS BERNARD
GARNAR, J. H.
GIMSON, S. A.
GIMSON, J. M.
HARPER, G. P., M.A.
HARVEY, J.
HARVEY, R., LL.B.
HERNE, F. S.
HOPPS, J. A.
ISLIP, Mrs.
KELLY, W., F.S.A.
KIRWAN, G. R., M.A.
LEE, T. C.
MOTT, F. T., F.R.G.S.
MOORE, A. P., M.A.
PAGET, A. H.
PAUL, J. D., F.G.S.
ROLLESTON, J. F. L.
STEVENSON, G. F., LL.B.
SIMPSON, WILLIAM
SCAMPTON, JOHN
STRETTON, Mrs. A.
STOCKS, Rev. J. E., M.A.
SQUIRES, Miss
TURNER, W. H.

13 Sectional Associates.

ADDERLY, Miss
BENNETT, A. H., LL.B.
BILLSON, Mrs C. J.
BOLUS, Miss
ELLIS, Miss G.
ELLIS, Miss H.
ELLIS, Mrs. B.
GIMSON, Mrs. J. M.
HARPER, Mrs. G. P.
HARVEY, Mrs. R.
HAYES, Miss E. A.
PAUL, Mrs. J. D.
TAYLOR, T. S.
TAYLOR, W.

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The Section meets on the third Tuesday in each month at 7 p.m.

There have been six meetings of the Section held, the average attendance being 12.

The following Papers have been read :—

October 20th, 1891.—The CHAIRMAN'S Inaugural Address, "*An Edinburgh Review Editor and his Contributors.*" (Published in the Transactions.)

November 17th. Mr. A. H. BENNETT, LL.B., "*An English Village in the 13th Century.*" (Published in the Transactions.)

December 8th. Mr. F. S. HERNE, "*Two Old Libraries of Leicester.*" (Published in Pamphlet form.)

January 12th, 1892. Mr. C. J. BILLSON, M.A., "*Giants: A Study in Folk Lore.*"

March 15th. Mr. FERGUS BURDETT, "*The Decay of Rhetoric.*"

April 12th. Rev. J. E. STOCKS, M.A., *The Roll of Bishop Hugh of Wells (1209-1235) for the Archdeaconry of Leicester.*" (Published in the Transactions.)

The Magazines supplied to the Section during last year have been discontinued.

Mr. C. J. BILLSON, has been elected Chairman for the 1892-3 Session, and Mr. F. S. HERNE (Permanent Library) Secretary.

J. M. GIMSON, *Chairman.*

FOLK LORE COMMITTEE OF LEICESTERSHIRE AND RUTLAND.

At the meeting held on January 12th initial steps were taken for the formation of a Folk Lore Committee for the collection of both printed and oral matter on the lines recommended by the Folk Lore Society. A Committee was eventually formed at the March meeting, with Mr. C. J. BILLSON as Chairman and Mr. F. S. HERNE as Secretary.

Two Meetings of the Folk Lore Committee (in connection with the Section) have been held, 25 members being present.

March 31st.—Mr. F. SIDNEY HARTLAND, F.S.A., was present as a deputation from the Council of the Folk Lore Society, and addressed the Committee on the objects to be kept in view, and the methods to be adopted in the collection of material. Many of the members undertook the collation of local histories and other printed matter.

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May 10th. Mr. C. J. BILLSON, M.A., read a Paper on "*Two old Leicestershire Customs—Hunting the Hare and Kicking the Bottle.*" The substance of this Paper will be incorporated in an Article by Mr. BILLSON on "*The Easter Hare,*" which will appear in a forthcoming number of "Folk Lore."

A Sub-Committee was formed for the purpose of carrying out certain recommendations received from the Organization Committee of the Folk Lore Society.

The Council has voted the Annual Subscription of One Guinea to the Folk Lore Society on behalf of the Committee, so as to secure copies of "Folk Lore," and other publications.

F. S. HERNE, Secretary.

REPORT OF SECTION "D."

FOR BIOLOGY (ZOOLOGY AND BOTANY).

1891-92.

Roll of Members and Sectional Associates.

Chairman—Rev. T. A. PRESTON, M.A., Thurcaston Rectory, Leicester.

Vice-Chairman—Mr. F. T. MOTT, F.R.G.S., Birstal Hill, Leicester.

Secretary—Mr. J. J. W. KNOWLES, 25, St. Stephen's Road, Leicester.

Members.

BARFOOT, W., J.P.
BILLSON, C. J., M.A.
BURFORD, S. F., F.C.S.
CARTER, THOMAS, LL.B.
CHARTERS, Mrs. R.
CLEMENTS, R. N., L.R.C.P.
COOPER, C. W., M.B.
COOPER, E. F., F.L.S.
FINCH, J. E. M., M.D.
GARNER, J. H.
GRUNDY, W. E.
HOTTINGER, Miss
KNOWLES, J. J. W.
MOTT, F. T., F.R.G.S.
NOBLE, Miss
OVERTON, R.
PRESTON, Rev. T. A., M.A.
THORP, J. T.
TURNER, G. C.
VICE, W. A., M.B.
WARREN, Miss

Sectional Associates.

ADDERLY, Miss
AGAR, Rev. W.
BATES, F.
BOLUS, Miss
BOUSKELL, F.
BURN, J.
BUTLER, G.
CLARK, Miss G.
GILBERT, T.
GRUNDY, Miss
HEADLEY, C. B.
MOSS, W.
MOTT, Mrs.
OLDAKER, Miss
STORER, G. H.
WARD, Miss M. C.
WATCHORN, T.
WHITTINGHAM, Rev. W. G., M.A.

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Members, 39; viz:—Members of the Society, 21; non members, 18. The Section has lost one member by death, and five by resignation. Four new members have been elected, making a decrease of two.

Evening Meetings:—The third Wednesday in each month, at the Museum, at 7 p.m.

Field Days:—The second Wednesday in each Summer month, at about 3 p.m.

During the past year the Section has held eleven evening meetings, with an average attendance of thirteen members, viz.:—nine gentlemen and four ladies; the maximum being nineteen, and the minimum eight.

The following Papers have been read and discussed:—

September 16th, 1891.—"*The Winter Aconite (Eranthis hiemalis),*" by the CHAIRMAN.

October 21st.—"*A Ramble in the Abbey Park,*" by Miss HOTTINGER. (Published in the Transactions.)

November 18th.—"*The Mental Capacity of Animals,*" by the VICE-CHAIRMAN. (Published in the Transactions.)

December 16th.—"*Study of the Order Insectivora,*" by the VICE-CHAIRMAN.

January 20th, 1892.—"*On the connection between Weather and the Flowering of Plants,*" by the CHAIRMAN.

March 23rd.—"*Stings and Poison-Fangs,*" by the VICE-CHAIRMAN. (Published in the Transactions.)

April 20th.—"*The Leicestershire Pond-weeds (Potamogetons),*" by MR. E. F. COOPER, F.L.S.

May 18th.—"*Study of the Order Ranunculaceæ,*" by the VICE-CHAIRMAN.

In addition to the regular Papers several interesting "Discussions" have been held, and a large number of objects have been brought to the meetings by various members, including Wild and Garden Flowers, Fungi, Mosses, Shells, Eggs, Skins, Leathers, Silks, Seeds, Insects, &c., from which much instruction has been derived. One useful work at the evening meetings is the naming of Specimens brought by the younger or less expert members.

There were three *Excursions* during the year viz.:—to Braunstone, to Swithland, and to Bradgate.

The following Periodicals have been circulated among the members of the Section, and deposited in the Society's library at the close of the

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year, viz. :—"The Annals of Botany," "The Journal of Botany," "The Kew Bulletin," "Science Gossip," "The Westley Society's Magazine," and two parts of "Nature."

The Reading Circle in connection with the Home Reading Union, was not found to meet the general wants of the members, and has been abandoned.

The Herbarium has been fairly started. About 600 specimens of Leicestershire Plants have been collected, dried, mounted and arranged during the year, and can now be used for reference by any member of the Society.

The meetings have been held since November, 1891, in the new Council Room. At first the reverberation of sound in this room made it very difficult to hear what was said, but since it has been more fully furnished this defect is much lessened, and the improved accommodation is greatly appreciated by the members.

The Section has suffered a serious loss in the death of Dr. TOMKINS. He occupied the Chair of the Section during the year 1887-8, and was a zealous and valuable member.

T. A. PRESTON, *Chairman.*

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REPORT OF SECTION "E."

FOR ZOOLOGY AND GEOLOGY.

Roll of Members and Sectional Associates.

Chairman—MONTAGU BROWNE, F.G.S., F.Z.S., Town Museum.

Vice-Chairman—F. M. POPE, B.A., M.B., Prebend Street.

Secretary—F. R. ROWLEY, Town Museum.

Members.

ANDERSON, J. S.
BATES, E. F.
BOAM, F. W., F.G.S., F.C.S.
BOND, C. J., F.R.C.S.
CLEMENTS, R. N., L.R.C.P.
DRAPER, A. T.
HARVEY, R., LL.B.
PATTISON, E.
PAUL, J. D. F.G.S.
PAYNE, Miss C. E.
RUST, A.
SQUIRES, Miss A.
STRANGWAYS, C. FOX, F.G.S.
VICE, W. A., M.B.
WALKER, T.

Associates.

BOUSKELL, F.
BROWN, T.
BURCHNALL, W.
BURROWS, T.
CREAGHE-HAWARD, L.
DAVIES, J. T., M.D.
EDGE, Miss
ELLIOTT, O. T.
EVANS, W. A.
HEADLY, C. B.
HODGES, L.
HOW, F. F.
HOWITT, H.
LANCASTER, Rev. R. W., M.A.
LAWRENCE, T. C.
MACAULAY, T., M.R.C.S.L.
MACLACHLAN, G.
MATTHEWS, Rev. A., M.A.
MOORE, E.
PALMER, J.
PALMER, T.
PARR, J. G., M.R.C.V.S.
PATEY, Miss E. N.
QUILTER, H. E.
SPARKES, Rev. A. L., M.A., B.Sc.
SQUIRES, Miss
STORER, G. H.
WARD, G.

The Section has lost one member and four associates during the past year, two by resignation, and three by removal. One new member and three associates have been added to the list, making a total of 46 at present on the roll.

The record of the past year bears witness to the continued prosperity of the Section both financially and otherwise. At the evening meetings valuable papers have been read, and it is gratifying to state that the average attendance of members and associates is larger than formerly.

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The circulation of Scientific periodicals amongst the members has been found very helpful, and in spite of some difficulty caused by the inability of the Council to make a sufficient grant to provide Magazines for the coming year, it has been decided to supplement their grant from the Sectional funds, and thus prevent any serious break in the continuity of the scheme.

The increased space provided for meetings by the erection of a new room for the use of the Society at large, affords scope for a much greater development of Sectional work, and it is hoped that the Section may henceforth steadily increase both in numbers and usefulness.

Two excursions have been held during the past year. The Enderby Granite Quarries were visited on June 20th and, through the kindness of the Misses BARBER, a very enjoyable afternoon was spent at Narborough Bogs on June 27th. A more detailed account of the excursions has already been given in the Quarterly Report.

The following Papers and short communications have been read at the evening meetings of the Section—viz :—

June 8th, 1891. "*Some recent Geological Sections made in Leicester and the Neighbourhood*," by Mr. J. D. PAUL, F.G.S. (Illustrated.)

"*Description of Sections recently made on the Humberstone Road (Vulcan Road and Spinney Hills)*," by the CHAIRMAN. (Illustrated.)

July 6th. "*Notes on Indian Shikar*," by Mr. HAROLD LITTLEDALE. (Published in the Transactions.)

October 12th. "*Physical and Chemical Characters of Wool and Hair*," by Mr. GEORGE WARD. (Illustrated)

November 11th. "*The Present and Past Immigrations of the Grey Phalarope (Phalaropus fulicarius (L) to the shores of Britain*," by the CHAIRMAN. (Illustrated.) (Published in the Transactions.)

December 11th. "*Cell Formation*," by the SECRETARY. (Illustrated).

January 18th, 1892. "*Cornish Mines and Minerals*," by Mr. F. W. BOAM, F.G.S., F.C.S. (Illustrated.) (Published in the Transactions.)

"*Report on some Vertebrate Remains not hitherto recorded for the Rhætic Formation*," by the CHAIRMAN. (Illustrated.)

March 14th. "*The Hind-limb of Vertebrates*," by the VICE-CHAIRMAN. (Illustrated.)

April 11th. "*Notes on some East Anglian Birds*," by Mr. L. CREAGHE-HAWARD. (Published in the Transactions.)

May 9th. "*Notes upon the Mesozoic Fossil Fish Ceratodus, and its living representative Epiceratodus (Ceratodus) Forsteri (Teller), with exhibition of palatal and mandibular teeth from the Rhætics of Aust Cliff, Gloucestershire, and Spinney Hills, Leicestershire*," by the CHAIRMAN.

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RULES OF THE LEICESTER
LITERARY AND PHILOSOPHICAL SOCIETY.

I.

Object. The object of the Society shall be the general cultivation of Literature, Science and Art, by the following means, viz., lectures and discussions—the publication of reports, papers, and proceedings—the support of the Town Museum or of the Museum of the Society, in case it should revert to the Society under the terms of its presentation to the Town Council; and by any other means that may from time to time appear to the Council to be desirable.

II.

Management. The management of the Society shall be vested in a Council consisting of a President, four Vice-Presidents, a Treasurer, a Corresponding, Financial, and a Minute Secretary, all of whom shall be appointed annually, and of twenty-four other Members who shall be appointed for two years, twelve of whom shall retire from office annually, but shall be eligible for re-appointment. Five Members of the Council shall form a quorum.

III.

Annual Meeting. A General Meeting of the Society shall be held in the month of June, in every year, at such time and place as the Council shall appoint, for the presentation of reports, and the transaction of the general business of the Society. At this Meeting the President previously elected by the Council shall be installed; the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council shall be chosen in the manner hereinafter mentioned; and two Auditors shall be appointed by open nomination and election. All questions proposed at such Meeting, except such as involve an alteration of the Rules, shall be decided by the votes of a majority of the Members present, the President having a vote, and in case of equality, a casting vote.

IV.

Ordinary Meetings. The Council shall appoint the times and places at which the Society's Ordinary Meetings shall be held, and shall determine the business to be transacted at such Meeting, in conformity

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with Rule I. The discussion of theological or political questions, either by Lectures or Speakers, is forbidden.

V.

Special General Meetings.

Special General Meetings shall be called at the discretion of the Council, or on the requisition of eight Members addressed to the Minute Secretary, who shall give previous notice of such Meetings to every Member.

VI.

Election of Officers.

The President shall be elected by the Council, and the election shall take place at least one month before the Annual Meeting. Three weeks before the Annual Meeting, a paper for the nomination of the Vice-Presidents, the Treasurer, the Secretaries, and twelve Members of the Council, shall be placed in some room accessible to the Members. A list of the Members of the Society shall lie on the table at the same time. The nomination paper shall be open for one week, during which any member shall be at liberty to insert the names of persons to fill the several offices, notice having been previously sent to each Member that the list will be open, and of the place in which it will lie. A printed list of the persons so nominated shall be sent to each Member, ten days before the Annual Meeting, with a notice of the time and place of holding such Meeting. Each Member present and voting at the Annual Meeting shall deliver to the Chairman such printed list with a mark against the names of those for whom he votes, and the Chairman shall appoint Scrutineers to cast up the votes. The Scrutineers shall present a list of the persons voted for in the order of majority of votes, and shall hand over the voting papers to the Chairman, by whom they shall be immediately destroyed. The election shall fall upon those who have a majority of votes, and in case of equality the election shall be decided by lot. Lists containing more names marked than the number required shall be rejected. Vacancies in any of the offices, from whatever cause arising, shall be filled up by the Council.

VII.

Sections.

The Council of the Society may from time to time appoint Sections for the pursuit of particular branches of Science, Literature, and Art, and make By-laws regulating the constitution, organization, and management of such Sections. The Council may also from time to time extinguish any Sections, or amalgamate any two or more Sections. The Council may if they shall think fit make provision for the appointment of persons not Members of the Society as Members of the Sections.

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VIII.

Admission of Members.

Every Candidate for Admission shall be proposed and seconded in writing by two Members of the Society, and the nomination paper when complete shall be forwarded to the Museum under cover, addressed to the President. The names of all such Candidates shall be read out at the next meeting of the Council, and submitted for election at a subsequent Meeting. All such elections shall be announced at the ordinary meeting of the Society next ensuing

IX.

Subscriptions.

Each Member shall pay an annual subscription of one Guinea, which shall entitle him (1) to a Member's Ticket, not transferable; (2) to two Visitor's Tickets issued by the Council for each Lecture of the Session; (3) to the right of purchasing additional Tickets. The Annual Subscription shall be due in the month of June, and shall be payable in advance.

X.

Life Members.

Life Members may be admitted on payment of ten years' subscription in advance. They shall be nominated and elected in the same manner as Ordinary Members, and shall have like privileges.

XI.

Honorary Members.

Honorary Members shall be nominated and elected as in the case of Ordinary Members, but no person shall be nominated as an Honorary Member without the previous sanction of the Council. Honorary Members shall have the same privileges as Ordinary Members, with regard to attendance at Meetings of the Society, the right to take part in Discussions, and Tickets of Admission to Lectures.

XII.

Associates.

The Council shall have power to elect Associates of the Society, on payment of half-a-guinea annually. Associates shall have admission to all the Lectures and Social Meetings of the Society by Tickets, not transferable.

XIII.

Additional Tickets.

The Council may issue to any Member, Life Member, or Honorary Member, additional Tickets available for one Session, at 7s. 6d. each; such Tickets to be transferable, but to be used only by persons belonging to the Member's household.

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XIV.

Visitors. Visitors shall be admitted to the Meetings of the Society, on production of a Visitor's Ticket signed by a Member, but no such Ticket shall admit any Gentlemen resident in Leicester, unless he be an inmate of a Member's household. Any person, however, may be admitted on production of an order signed by the President of the Society, or by the Chairman for the evening. The Council shall have power to make such special regulations from time to time for the admission of Visitors as may appear necessary.

XV.

Resignations. Members intending to resign shall notify their intention to the Financial Secretary, before the Annual Meeting.

XVI.

Application of Funds After payment of the expenses of the Society, any surplus Funds may be disposed of in the manner which the Council may consider most conducive to the advancement of the objects of the Society.

XVII.

Alterations of Rules. No rule shall be made, rescinded, or altered, without the consent of two thirds of the Members present at the Annual Meeting, or at a special General Meeting convened for the purpose. Not less than seven days' previous notice of every proposed alteration shall be given.

XVIII.

Council to make By-Laws, &c. The Council shall have power to make By-laws and Regulations not inconsistent with the foregoing Rules.

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By-Laws.

RELATING TO THE CONSTITUTION AND ORGANIZATION OF SECTIONS.

In pursuance of the powers conferred on them by Rule VII., the Council on the 4th of November, 1887, adopted the following By-laws in the place of those then existing.

1.—Any Member or Associate of the Society may join any Section upon giving his or her name to the Secretary of that Section, and paying to its funds an Annual Subscription of 1/-.

2.—Persons, not Members or Associates of the Society, may be elected to any Section by its Members, and shall pay an Annual Subscription of 2 6 to the funds of such Section.

3.—Each Section shall elect annually a Chairman and Secretary. The Chairman shall be a Member of the Society.

4.—For Sectional purposes the year shall terminate on the 31st of May, and the annual Election of Officers by each Section shall take place at the Meeting of the Section next preceding that date. Casual vacancies shall be filled up as they occur by the Sections respectively. All Elections of Sectional Officers shall be reported to the next ensuing Meeting of the Council.

5.—Each Section shall, on or before the first Friday in March, June, September, and December, present to the Council, a Quarterly Report of its Transactions and a Statement of the Meetings to be held during the ensuing quarter, which, subject to the approval of the Council, shall be published in the Quarterly Transactions of the Society. Each Section shall, if practicable, at the same time present to the Council at least one paper *in extenso* read before that Section, and the Council may direct that any such paper shall be printed in the Quarterly Transactions of the Society, with all necessary illustrations, in such form and manner as the Chairman of the Section shall recommend.

6.—The Quarterly Report of each Section, presented on or before the first Friday in June and published in the July number of the Transactions, shall be made up to the 31st of May, and shall contain in addition to the Quarterly Transactions of the Sections, the Roll of Members, the names of the Officers of the past year, and of those elected for the ensuing year, and an abstract of the work of the Section during the past twelve months.

7.—The Council may, on the application of any Section, make grants of money for any object connected with the work of the Sections.

8.—Any six Members or Associates of the Society who desire the establishment of a new Section may memorialize the Council to that effect, but no section shall be established without the consent of the Council.

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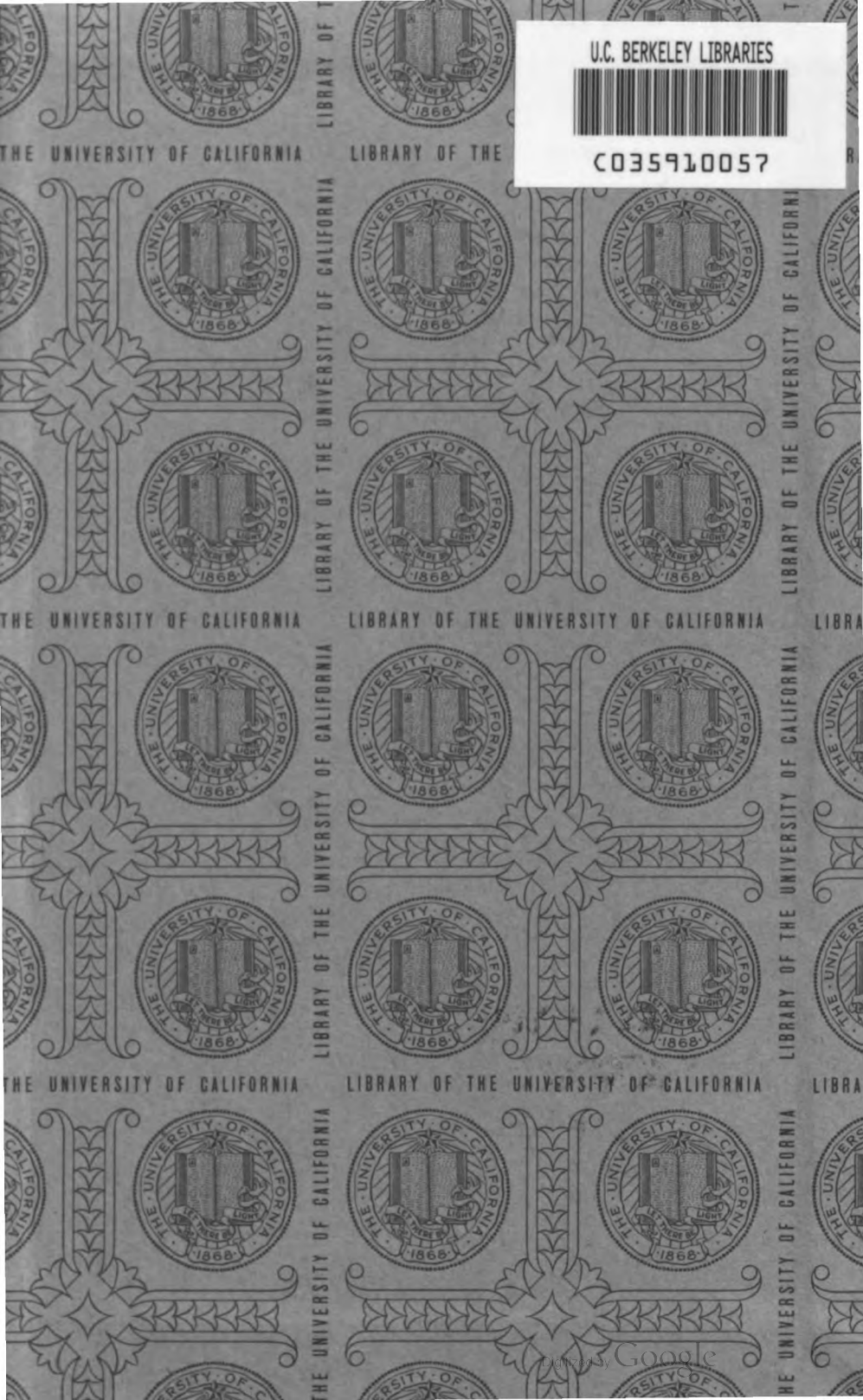

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